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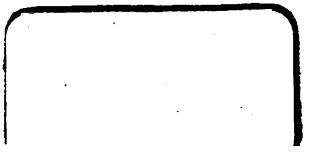
G. A Wilts 8° 62



# REPORT

OF THE

# MARLBOROUGH COLLEGE

# Natural History Society,

FOR THE

## HALF-YEAR,

## ENDING MIDSUMMER, 1869.

"Tum mihi Naturæ Libeat perdiscere mores:
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH:
Printed by C. Perkins, Times Office.
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# PREFACE.

We may once more preface our Half-yearly Report, by stating that the Society has every reason to be satisfied with its progress. Its activity in former directions has not diminished, and it has struck out new lines for itself. The principal novelty of the last half year was the Conversazione. It was thought that the Society had been long enough in existence to justify it in celebrating some sort of public anniversary. Its members were also anxious to acknowledge, to the best of their ability, the great kindness and constant assistance they had received from friends and neighbours, and at the same time to interest a still larger number in the work.

The MASTER and the LIBRARIAN kindly consented to allow the use of the Library for the occasion, while the Bursar undertook to provide for the bodily wants of our guests, and we must add he was as good as his word, and better. The heads of sections displayed the most striking specimens of their several departments; one side of the room was lined with flowers, and what with skins, birds, and butterflies, the library presented a striking contrast to its usual sombre appearance. But we must not omit what seemed to be the centre of attraction,—four binocular microscopes of MR. ROSS, for the loan of which the Society was indebted to the kindness of one of its warmest supporters, DR. WALKER.

To the same gentleman it owes its hearty thanks for an admirable lecture on the human nerves, fully illustrated with diagrams and specimens.

Another stranger, MR. BEESLY, delivered an eloquent account of Dr. KANE'S Arctic Expedition. The maps to illustrate the lecture were drawn by D. E. LEIGHTON.

One of the most serious difficulties of the Society has been to provide sufficient pabulum for its fortnightly meetings, and we hope that other strangers will follow the example of MR. BEESLY and DR. WALKER.

The attendance at meetings has been on the whole satisfactory, but it has been subject to considerable fluctuation. We hope that next half it will not only be more regular, but also that the audience will be drawn more and more from the higher and older members of the school. Several of its members we are glad to notice appeared at the head of their forms in the Midsummer examination, a fact of itself sufficient to disprove the prejudice that the pursuit of Natural Science need in any way interfere with school work.

A list of donations to the Society will be found in the Report, but we may especially mention the following:—Coins from H.R.H. Prince Leopold, Mrs. C. W. Tayler, Rev. C. Soames, Rev. H. Bull, and Rev. J. D. Hodgson; pearl mussels from Conway, from Dr. Thurnam; and various donations from W. S. Bambridge, Esq., Sergeant Adams, Mr. Cane, Mr. Piper, Mr. Wooldridge, Mr. Jones, Mr. Parker, Mr. Neate, and Mr. Sawyer. From Old Marlburians, many of whom appear among our list of honorary members, donations from R. B. L. Everard, Esq., and W. W. Fowler, Esq. The Rev. J. M. Fuller still continues to shew his kind interest in the Society, by forwarding the Nos. of the "Popular Science Review," and the "Student," as they are published.

# LIST OF MEMBERS.

**PRESIDENT:**

Rev. T. A. Preston.

**SECRETARY:**

G. E. Manisty.

**TREASURER:**

Rev. T. A. Preston.

**LIBRARIAN:**

E. Almack.

**COMMITTEE:**

The Ex-officio Members.
C. M. Bull, Esq.
F. Giles.
W. D. Fenning.

**HONORARY MEMBERS:**

The Rev. the Master.
A. Armstrong, Esq.
H. M. Moule, Esq.
W. E. Mullins, Esq.
F. E. Thompson, Esq.
C. M. Bull, Esq.
Rev. J F. Bright.
Rev. J. Sowerby.
Rev. H. Bell.
Rev. C. W. Tayler.
A. Babington, Esq.
W. Fergus, Esq., M.D.
E. J. Turner, Esq.
S. B. Dixon, Esq.
W. H. Macdonald, Esq.
F. Storr, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
S. Image, Esq.
A. C. Almack, Esq.
E. F. im Thurn, Esq.
G. K. Mills, Esq.
F. Bonney, Esq.
T. H. Dumergue, Esq.
R. W. Tayler, Esq.
W. Mansell, Esq.
Rev. G. W. DeLisle.
R. F. Isaacson, Esq.
W. Koch, Esq.
G. T. Spankie, Esq.
W. W. Dayman, Esq.
H. A. Evans, Esq.
Rev. J. W. Mills
C. E. Sewell, Esq.
J. Walker, Esq., M.D.

**MEMBERS:**

F. J. H. Jenkinson.
A. C. Hilton.
H. M. Hilton.
E. Almack.
J. B. Oakeley.
J. B. Fuller.
M. H. Smith.
G. E. Manisty.
H. Manders.
A. H. B. Reynardson.
C. A. Sladen.
E. L. Hesketh.
B. J. Guillemard
H. S. Sankey.
C. F. Harrison.
W. D. Fenning.
A. de B. Hovell.
H. J. Verrall.
P. L. Hesketh.
J. W. Hockin.
F. Giles.
E. H. Wyatt.
H. R. Armstrong.
J. F. Cornish.
R. Rocke.
D. E. Leighton.
H. C. Spry.
J. H. R. Clark.
G. C. Mansell.
E. Owen.
C. A. Champneys.
E. F. Vicars.

# RULES.

1.—That this Society be called the Marlborough College Natural History Society.

*Constitution.*

2.—That the Society consist of Members and Honorary Members.

*Officers.*

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by Members of the Society.

*Management.*

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

*President.*

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any member of the Society to take the chair.

*Committee.*

7.—That on the occurrence of any election, each member of the Committee have double the number of votes of any other Member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in Editing the Report.

*Secretary.*

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee, appointed by the President.

*Treasurer.*

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence that of the Secretary.

*Librarian.*

14.—That the duties of the Librarian be to keep a catalogue of the Library, with the names of the donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Reports of the Society.

*Library.*

15.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Commitee, be allowed to be taken from the room.

16.—That if any member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

*Museum.*

19.—That any member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purposes of study, provided there be a reasonable excuse for their not belonging to a section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

*Members.*

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.* to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1*s.* on Election.

25.—That Members have the right to be present, to state their opinions, and to vote at all general meetings of the Society: to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the Report half-yearly.

*Visitors.*

26.—That on such occasions when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

*Honorary Members.*

27.—That Honorary Members have all the privileges of Members, except the power of introducing a member of the School to the meetings of the Society.

*Suspension of Members.*

28.—That any member be liable to be excluded from the Society by the Committee if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

*Sections.*

29.—That sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these sections shall hold meetings as often as shall seem fit to the Heads of the several sections, at which any member of the School with the sanction of the Head of that section, may attend.

*Meetings.*

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

*New Rules.*

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

## MEETING HELD FEBRUARY 19TH, 1869.

THE following donations were announced, and thanks ordered to be given to Donors :—

Three Spears from the Feejee Islands, Tooth of Asiatic Elephant, Saw of Saw-fish, jaw of Shark, and specimen of Mummy Cloth by Sergeant Adams.

A British specimen of the Spoonbill, and a young Nightingale shot on Overton Downs, by E. F. im Thurn, Esq.

A pair of Cross-bills (*Loxia curvirostra*), by J. B. Oakeley.

A War Club from Abyssinia, by G. E. Manisty.

A Groat of William and Mary, by Mr. C. Perkins.

Collections of minerals by H. C. Spry, H. S. Sankey, Johns, Waldron, and W. D. Mann.

A basket and eggs coated with Carbonate of Lime from the dropping well at Knaresborough, by H. C. Spry.

EXHIBITIONS.

A bowl made of Bitumen from the Dead Sea, by E. Almack.

Specimen of *Dendrobium* in flower, a branch of the curious plant *Coccoloba platyclada*, and a leaf of the Pitcher-plant (*Nepenthes Distillatoria*) by E. F. im Thurn, Esq.

R. W. Taylor, Esq., was elected an Honorary Member.

S. B. Dixon, Esq., jun., then read the following paper on

## THE ORIGIN OF SPECIES.

THERE is no subject at the present time of such deep interest to all students of Natural Science as that of the "Origin of Species," nor is there a theory so much misunderstood as the one propounded by Mr. Darwin in his work upon it.

Following close upon this subject, though by no means inseparably connected with it, so far as Mr. Darwin is concerned, is the question whether all animals and plants have descended from some one prototype and this gives

still greater interest to it. I purpose in this paper to give as far as I am able a short explanation of Mr. Darwin's theory, and of some of the facts upon which it is based. Before doing so, we must, however, endeavour to understand what is meant by the term species. All organic nature is divided into two *Kingdoms*, the *Animal* and the *Vegetable*. Each of these is again divided into *Sub-Kingdoms*. These again into *Provinces*, the *Provinces* into *Classes*, the *Classes* into *Orders*, the *Orders* into *Families*, and the *Families* into *Genera*. I have here followed the nomenclature of the animal kingdom, but that of the vegetable kingdom would have brought us to somewhat the same point. Where in a genus two groups of animals are separated from each other by constantly recurring characteristics, which are not sexual, no matter how slight and trivial they may be, such characteristics being steadily transmissible by reproduction, then the animals of these two groups would be said to belong to two species. As Professor Huxley says, for the practical naturalist it is a mere question of structural difference. I do not pretend to say for one moment that the definition I have given is not open to objections; in fact it is a matter of very great difficulty to know how the term species can be accurately defined, and no two naturalists will agree upon a definition. I think, however, that the above will be sufficient for our present purpose. I have said that the differences are transmissible by reproduction. Now it is a well known fact and one admitted on all sides that organic matter of every kind has a tendency to vary. The great question therefore is can species so pass and accumulate their variations by inheritance as in the end to bring about specific differences, or in other words to give rise to new species, which have some transmissible variation. That they can do so is what Mr. Darwin contends. To use his own words he says, "I can entertain no doubt that the view which most naturalists entertain and which I formerly entertained, namely, that each species has been independently created is erroneous. I am fully convinced that species are not immutable, but that those belonging to the same genera are lineal descendants of some other and generally extinct species in the same manner as the acknowledged varieties of any one species are the descendants of that species. Furthermore I am convinced that Natural Selection has been the main but not exclusive means of modification." What is this work performed by Natural Selection? I have already mentioned that amongst all organic beings in a state of nature there is some individual variability. How then do the varieties thus produced, and which may be called incipient species, become converted into good and distinct species? There is incessantly going on in Nature what Mr. Darwin calls a "Struggle for Existence," and we shall best understand the meaning of this expression by taking some familiar instance. Take one single plant and suppose that it shall be on the earth with no opponents, no helpers, and no rivals, and that it

requires one foot of land on which to grow. Suppose further that it is a plant that will produce 50 seeds every year, and by the action of wind and currents these seeds shall be equally and gradually distributed over the whole surface of the land. What will happen on this? In the first year the one plant will have increased to 50. In the 2nd year these 50 will have increased to 2500, and so on in geometrical progression that in the 9th year the single plant will have increased to such a degree that there will not be sufficient space on the whole earth to accommodate the descendants. There must therefore be in Nature some principle to counterbalance this great increase of organic life and this is the "Struggle for Existence." All the 50 seeds cannot possibly become plants. Each one is striving against the others. In fact 49 are striving against one, and the result is that the smallest possible start that anyone seed may have, will give it such an advantage as will enable it to get ahead of all the rest. Any variation however slight and from whatever cause proceeding, if it be in any degree profitable to an individual of any species in its complex relations to other organic beings, will tend to the preservation of that individual. This variation, too, when once started, has a tendency to become hereditary and descend to the offspring. It must be borne in mind that it is not only the preservation of the one seedling that is noticeable, but there is also the destruction of all the other seedlings; therefore anything that causes much destruction also plays a part in the struggle for existence.

These causes are but little understood and no doubt at present not fully appreciated. Many seedlings must be most probably destroyed from germinating in ground too thickly stocked with plants. The amount of food must give a limit to the rate of increase of each species of animals, and climate, as extreme drought or cold, must have a great effect on the destruction of organic life.

These are only a very few of the many causes that play a part in this struggle, but all I wish you to understand is that a such struggle is incessantly taking place in Nature, and that as a consequence of it a great destruction inevitably ensues.

We have now to ascertain how the struggle acts in regard to variation. The reciprocal relations of all organic beings to one another are no doubt most intimate and it is not to be wondered at that whenever a variation arises, no matter how slight it may be, if favourable to the particular individual, it should have a chance of being preserved and propagated, and that if on the other hand a variation arises, at all injurious to the individual, it should assuredly be destroyed. This principle of the preservation of favourable variations and the destruction of injurious ones is what Mr. Darwin calls Natural Selection. I shall explain by and bye that a somewhat similar process is adopted by man and that results are attained somewhat analogous to those produced by

Natural Selection. It may be metaphorically said, bearing in mind what has been mentioned of the struggle for existence, that *Natural Selection* is always on the look out for variation, rejecting that which is bad, preserving that which is good, silently and insensibly working whenever opportunity offers, for the improvement of organic beings in *relation* to their organic and inorganic conditions of life and consequently in most cases to what must be regarded as an advance in organisation. The work may be so slow as to be quite imperceptible and unappreciable, for in no case does the motto "Natura non facit saltum" more strictly apply than it does to the process of variation.

When too a variety has once arisen, there can be no doubt that it again varies, though it may be after a long interval of time and these further varieties, if favourable, are again preserved and so onward. We should also understand that is not only the variations thus inherited that separate descendants from the parent stock, but that there are many laws of correlation of growth in accordance with *which*, when one part of organisation has been altered by successive variations, or by the effects of Natural Selection, and thus become modified, other modifications ensue where we least expect them. Of these laws we know very little, but the facts are plainly observable. The whole organisation appears in fact to be so closely bound up together during its growth and development, that when variations occur, even though they may be but very slight ones, and become accumulated by Natural Selection, other parts become modified. Mr. Darwin gives several most interesting examples of the effects of this correlation of growth and I am sorry I have not time to repeat them. It is of course very difficult indeed for us to watch the effect of Natural Selection with organic beings. The process may be so extremely slow that the effects can be but scarcely visible.

Again the difficulties that arise in thoroughly examining any specimen in a state of nature are by no means slight and we must remember that by removing an organic being from a state of nature to one more favourable for our observation we at once alter its conditions of life and thus preclude an accurate estimation of the work of Natural Selection. An alteration in the conditions of life is often nevertheless the cause of an increased variation. There is however a Selection going on around us that is far more easy to study than Natural Selection, the effects of which even though they may not be so great in the main as those of Natural Selection, are by no means unimportant. This is Man's power of accumulative selection. Nature in the first place gives variation and Man takes advantage of it and uses it to his own purpose. This selection is by no means difficult to study, and its effects are easily traceable in our domestic animals. Take the case of sheep for instance, some agriculturists have so modified the character of their flocks by the principle of selection as to change it altogether. This principle has been carried out by observing

differences probably quite inappreciable to one unacquainted with the varieties of sheep and so accumulating the differences in one direction as to produce in the end a sheep of quite different form to the original stock. The same principle is followed by Horticulturists with flowers. One of the many arguments urged against Mr. Darwin's theory is that if the power of the Natural Selection be fully admitted *all* organic beings attained a much higher state of perfection and how is it that there still continue to exist many of the lowest forms of life. In anwer to this it may be replied that Natural Selection does not necessarily imply an universal law of advancement and development but only takes advantage of those variations which are favourable to the individual in its complex relations of life. Unless the individual would be benefited by the development of the variation, Natural Selection would leave it unaltered. In order to realise fully the effect of variation under domestication Mr. Darwin turned his special attention to the study of domestic Pigeons.

The number of different breeds amongst these is very great (somewhere about 150) and the divergences of structure are most striking. Some, as the Pouters, have very long beaks and long legs. Others, as the Fantails, have exceedingly small legs and very small beaks. Others again, as the Tumblers, have still shorter beaks barely deserving the name. There are very many other most characteristic structural differences among the various breeds but I have not time to particularise them. At least 20 Pigeons might be chosen which if shewn to an ornithologist, as wild birds, would certainly be ranked as well defined species and some in fact placed in different genera. Yet Mr. Darwin fully believes this conclusion is generally accepted that all the different varieties of domestic Pigeons have descended from the Rock Pigeon (*Columba livia*). There are certain marks on the tail and wings of the Rock Pigeon which are very constant, and it is remarkable how frequently, in the case of thoroughly well bred birds, these same markings appear. When birds belonging to two distinct breeds are crossed, and neither of them has the particular markings the mongrel offspring is very apt to suddenly acquire them. Mr. Darwin explains this tendency on the principle of reversion to ancestral characters (confined however to colour exclusively), presuming that all the domestic breeds have descended from the Blue Rock Pigeon. Pigeons are generally supposed to have been domesticated for thousands of years and in several quarters of the world, and Mr. Darwin believes that nature having in the first place effected slight variations in individuals when the species was uniform, Man has gone on accumulating these variations by selection so as in the end to produce the numerous true and constant species. We have now to consider in what direction all that has gone before must eventually lead us.

What is the effect of this accumulation of variations aided by Natural Selection. If we grant that variation is hereditary and transmissible how are

we to limit the effects that may result from it? Time without stint is all that is wanted for variation and selection to do their work and Geology surely teaches us that as much time may be granted them as the most zealous advocate of the Darwinian theory can desire. We find the first traces of organic life in the Laurentian Rocks of Canada, and what countless ages must have elapsed since those Rocks were formed.

Again the earliest remains of man are found in deposits which geologically speaking, are but of yesterday, yet when we endeavour to fix a date to these deposits, we are almost overwhelmed by their immense antiquity. If we are satisfied that the effect of variation and selection is in the end to produce new species, where are we to stop? It is no doubt startling when we are fully conscious where this admission may lead us. If we allow that specific differences do not preclude the possibility of a common descent, why should generic differences? Nay, the principle being once granted of variation to an indefinite extent, the probality being once accepted that thousands of links in the chain of organic life, from the imperfections of geological record are either lost, or as yet undiscovered, sound induction points to but one explanation of the present divergences, great as they may be, of families, of orders, and of classes. Where indeed can we stop? And what shall we say of Man? He is bound up with the animal creation—their bodily wants and dangers are his also. Every bone in his body has its counterpart in his fellow mammalia. We set aside his non-material attributes, his art, his science, his religion, which if not entirely beyond the domain of physiology, are at any rate upon its extreme and but little trodden verge.

But we most fearlessly face the question, whether the independent organisation of man, with his startling resemblance to the anthropoid apes should be maintained in the face of the inevitable conclusions drawn from the facts which we have now discussed. Never be induced to repeat the absurd cry that Darwin says that men have sprung from mushrooms or gorillas. He says no such thing, he has only put forth a theory which whether right or wrong does marvellously account for the complex phenomena of organic life in a way that no other theory of the orgin of species has ever done before. The only fear of the true philosopher should be lest he may argue wrongly or from wrong premises; lest he may hastily build upon a theory upon insufficient data. He must not flinch from investigations because they may lead to startling results.

Regarding this difficult question as a Geologist, I cannot help thinking that the succession of life on the earth exhibits a most decided advancement and development, from whatever cause it may have proceeded.

When we regard the earliest form of life that has yet been *found*, the Eozoon Canadense and following upwards see how it has been gradually succeeded by

those higher in the scale, the reasonableness of Mr. Darwin's theory *receives* a strong support. The Geological Record, is no doubt, most imperfect so far as our present knowledge is concerned, and no Geologist would ever feel disposed to argue from negative facts in relation to it, yet at the same time the discoveries of the past few years point towards the corroboration of this theory. In one of the paragraphs in the chapter on the "Geological record," speaking of the sudden appearance of groups of allied species in the lowest known fossiliferous strata, Mr. Darwin says "Consequently if my theory be true, it is indisputable that before the lowest Silurian stratum was deposited, long periods elapsed, as long as, or probably far longer, than the whole interval from the Silurian age to the present day; and that during these vast yet quite unknown, periods of time, the world swarmed with living creatures."

This was written before the investigations had been made in the Laurentian Rocks (a vast deposit estimated as upwards of 30,000 feet thick, underlying and of an earlier period than the Silurian Rocks) which have been discovered to be composed of the remains of countless millions of a small Rhizopod, although at the time Mr. Darwin wrote supposed to be unfossiliferous. The day may be very far distant when this theory will be generally accepted as a true one, still I fully believe that the result of future scientific discoveries will tend towards its verification.

The gulf which was formerly supposed to separate the animal and the vegetable kingdoms is slowly but surely narrowing every day, and even of one or two organic beings it is difficult to say with which kingdom they should be classed.

Professor Huxley in a paper recently given at Edinburgh, and published in the *Fortnightly Review*, contends most strongly and with his usual power that the physical basis of life (whatever that may be) is the same with animals and vegetables.

I have endeavoured in this paper to give a short explanation of this difficult and much misunderstood theory, not with the least intention of adding anything in support of it, but in order that you may have some idea of its meaning. As a work "Mr. Darwin's Origin of Species" is one of the finest contributions to Natural Science that has appeared for many years, irrespective of the Theory founded upon it, and I would strongly recommend a careful study of it by any who are desirous of more accurately comprehending Mr. Darwin's Views.

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There were 65 persons present, 6 Honorary Members, 20 members, and 39 visitors.

## MEETING HELD MARCH 19TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:—

Some coins and tokens, among which were two golden saxon coins from Cornwall by H. R. H. Prince Leopold.

A collections of coins by Rev. J. D. Hodgson.

A Hornet's nest by J. B. Oakeley.

A collection of Swiss flowers by A. H. B. Reynardson.

A collection of mosses by G. E. Manisty.

Madden's "Roman coins" by W. D. Fenning.

The President exhibited some "Purple of Cassius," used for colouring glass, specimens of Meteoric Iron, Sargassum weed, and a Queen Termite.

W. D. Fenning then read the following paper, written by G. E. Manisty who was absent, on a

### VISIT TO ESGAIR.

To the careless thinker it might perhaps seem the easiest thing imaginable to choose a subject on which to read a paper before this Society.—"Oh, it does not matter the least, choose anything you like." That is all very well, no doubt, and it is very comforting to think that one is allowed perfect freedom in selection. But on settling down in earnest to write a paper, any former Utopian ideas are at once dispelled, first one thing is attempted, and then another, until at length it is found that no one subject is thoroughly known, nor sufficiently so to write at any length upon it. The disappointed dreamer then wakes to a sad reality and his only resource is either to work up some subject from books, or else to trust that before long something or other may turn up from his own experience. I have been compelled to follow the latter course. Even now, I have no particular branch of Natural History for my subject, but rather a medley, a little of one thing and a little of another, and not much of any. However, I am emboldened in my present endeavour by others who have trod the same kind of ground before me, and whom I hope not to rival, but to follow as best I may.

As Esgair is only the name of a small estate, I must give you its "local" habitation as nearly as possible. First, then, it is in Wales; secondly it is in Merionethshire: and lastly, it is about two miles from Machynlleth, a town in Montgomeryshire and quite an important place in Wales though it is quite conceivable that you may never have heard of it. I was staying with an uncle and an aunt.

The mode of my arrival was decidedly peculiar and not altogether encouraging. A quarter of a mile of water lay between the station and my final destina-

tion. The town of Machynllyth is situated in a valley through which the river Dovey passes, separating the town from Esgair. (The termination of the word Dovey is one form of the Welsh "gwy," water. Its other forms are traceable in Wye, Medway, and other names of rivers). Whenever there has been much rain, this river swells to an unusual extent, in fact over a distance of a quarter of a mile, from the base of the hills, on one side of the valley to the railway embankment on the other. It seemed to me rather an unusual thing to drive through a quarter of a mile of water, and horrible thoughts of watery graves, &c., darted through my brain. My fears however were dispelled by the very matter of fact way in which the horse entered it, which drove me to the conclusion that he had been through it so often before that he had become by second nature an amphibious animal. He struggled patiently through, and I at length reached the other side without even a splashing, although the carriage nearly touched the water very often. Speaking of Machynllyth I may remark for the benefit of the uninitiated, to whom Welsh is generally a great mystery, that though spelt Machynllyth this word is pronounced Mahuncleth.

When I was able to look around me the next morning, I was very much struck with the scenery. As it was about Christmas, of course there were not the varying tints of spring or summer to set it off, but, notwithstanding that, it was, as I have said, striking. The whole country as far as the eye could reach on all sides was a succession of bold hills and deep valleys. The house in which I was lay about 800 ft. above the sea level, and the top of the mountain on which it was built was 2000 ft. In the distance Cader Idris appeared on the North side and the peak of Plynlymmon on the South. The slate which composes all the rocks in that part of Wales presents very strongly marked scenery. Here a mountain rises abruptly two or three thousand feet; here a ravine descends precipitously to a considerable depth below the level of the plain.

I had a very good opportunity of noticing the different planes of what looks like stratification in the slate rocks. Scarcely any were perfectly horizontal, some were more or less inclined, others perpendicular. The layers of cleavage too must vary greatly, for some slates split into minute fragments almost as soon as they are touched, and are therefore useless, whereas in the slate-quarries there are solid blocks more than an inch thick, and several feet in length. Many of the houses in that part of Wales are built entirely of slate, and they present rather a pretty appearance.

The slate naturally is the chief source of wealth in this part of Wales. All day long reports may be heard from the slate quarries caused by the blasting of the rock. These quarries are almost innumerable and certainly rather spoil the appearance of the country. On nearly every hill side you may

see large heaps of fragmentary slate which indicate that there either is or has been a quarry close by. It happens sometimes that quarries are commenced in places where the slate is not good, and then they are left just opened. Sometimes they are worked in the open air, and at others under the ground, being entered by a kind of tunnel. I went over one which was worked in the former manner, and it is certainly highly interesting to see the different processes through which the slate passes from the time of its being blasted until it is completed. The whole is accomplished with wonderful rapidity, and the thick slabs are smoothed down and cut up by immensely powerful machinery just as if they were wood. This quarry however, was almost nothing compared to many, especially that of Pehnryn, where upwards of three thousand men are employed. The quarries are of course the chief source of employment for the lower classes, who, by the way, seemed to me to be infinitely superior to the mining population in the coal districts. The quarriers are as a class wonderfully sober, in fact, for the most part, teetotallers; whereas the miners of the more Northern part of Wales are, more often than not, drunkards. Taking the poor generally of the respective districts, around Esgair they are much cleaner and more civilised altogether than their neighbours in Denbighshire. Indeed the women are so industrious that you not unfrequently see them economising their time by knitting as they are walking along. The Welsh element remains stronger in this district than in and about Denbighshire, and many of the old inhabitants do not know a word of English.

The mountains being composed almost entirely of slate are naturally very unproductive. About half way up, they are covered with wood, and at the top with heather or gorse, and sometimes grass. But still the inhabitants contrive to turn their high land to some account. The tops of the mountains are generally covered with sheep, and, as I before said, lower down trees are grown. I noticed that all the woods were composed of young trees (oaks for the most part). On enquiry, I was told that it is usual to cut down these diminutive forests about every thirty years and to plant young ones in their place. The branches are sold for fire wood (and strange to say are as dear as coal), and the trunks as timber. By these means it is found that the trees yield more profit than they could be made to do in any other way.

My first thoughts on arriving at this delightful spot were how to do something or other for the Natural History Society. I was told that an incredible number of *mosses* were to be found in the neighbourhood, and therefore, though no Botanist, I determined to get as many varieties of these as I could. The pursuit had all the attractions of novelty and of change of scenery. I need not tell you that some mosses only grow on high hills, and there you must go to get them, while others again only grow in valleys, into which you must descend to get *them*. Certainly it would be difficult to imagine any spot more

favourable for variety of mosses than the neighbourhood of Esgair, for there is such variety of dry and damp, of high and low. At the foot of nearly every hill the slate rocks are saturated with water which is constantly trickling down, unless the weather is very dry. One of the prettiest features of the country is the countless number of little rills and diminutive torrents which come sparkling and dashing down over the steep rocks. Some of them really seem to be almost perpendicular as you look up at them from below, and you wonder how it is that they do not leave the surface of the rocks and dash in a volume through the air. I could hardly bring myself to believe it when I was told that there were trout in many of the less steep streams. However, I was converted to *this* creed during my stay by seeing a trout pulled out of a small ditch, you might almost call it, not more than 5 or 6 feet wide. What was still more incredible was to be told that there are *salmon* in such shallow steep streams. This too however I at length learned to believe; a spot in such a stream was pointed out to me by a gentlemen who told me that two seasons before he had there shot a salmon, mistaking its dark back for an otter. It was not until the under shining scales turned up, that he discovered his mistake. I can quite fancy a salmon getting over a wear, knowing from a paper on the subject last year by G. H. Dawson, Esq., that they have immense powers of springing; but I was not prepared to fancy their ascending these endless wears; for many of these streams are such, both in steepness and rapidity. It was long believed, in fact, from time immemorial, by the inhabitants that in a stream of the nature which I have been describing a famous robber had once had his cave. Last summer, however, a gentleman in the neighbourhood thought that he would examine the place and see if there was any probability of the truth of this legend, He went accordingly one day, prepared for a dip, as the water was very deep, and managed to get close up to the spot where the cave was said to be. All doubt as to the truth of the report was completely removed; there was no cave at all. I saw the place myself, and it certainly *did* look as if there was a hole in the rock. The water descended in a fall over an almost sheer rock, and at the bottom of this was a deep hole, that is to say 9 or 10 feet deep. Of course the rock at such a depth, with the water running over it looked very dark, and had a cavern-like appearance. Though the stream was so deep at this one part, it was not more than six feet wide, and in most places hardly a foot deep.

But to return to where we were when this digression arose. I was speaking of the variety of mosses and the variety of habitation for them. There are some species which grow almost in the water, at least never anywhere but in damp places. Such is the 'Bog moss,' so called because it is found in bogs or moist ground of some kind. The very appearance of this variety shows its nature and habits, for it is a very pale green, almost white,

just if all the colour had been washed out by the constant influence of water. Many Lichens, too, are to be found even in the beds of rivers, on any projecting rock. These species of Lichen are very easy to procure, that is to say, some of the common kinds, but it is very hard, in fact, almost impossible, to press them so as to keep their natural appearance. While growing, they are saturated with moisture, and when that is driven out by the process of drying and pressing, the leaf shrivels up and loses its bright colour. Other mosses, for the most part the commonest, seem to thrive almost anywhere, regardless of dry or damp, as long as there is a sprinkling of soil for their roots. Some of the 'Fork-mosses' are of this nature. The great Botanist, Mr. Bloxam, had paid a visit to Esgair previously to my going there, and he said that he had never in England or abroad found such variety both of mosses and lichens as he found there. There is one moss which seems only to grow at a considerable elevation, for it is only to be found on the highest mountain near Esgair, namely, Arran-y-gesil. This is the Fir Club Moss, a peculiar species very like a fir-tree and very unlike most other mosses. As I devoted nearly a day to procuring a specimen of it I shall venture to make another digression. Arran-y-gesil is, I believe, about the sixth highest mountain in North Wales, being nearly 4000 ft. high. It stands at the end of a valley, the two sides of which are formed by two 'arms' of the mountain itself, forming what is very like a gigantic arm-chair. I rather fancy, indeed, that the name Arran-y-gesil denotes the "giant's arm-chair," but I am not certain and therefore will not make a positive statement of it. One day after having beaten a considerable portion of the valley leading up to Arran in the hope of rousing a few woodcocks and having failed most signally in the attempt, I was enticed by the imposing appearance of the mountain to reach the top, and from it to obtain a view of the surrounding country. The task seemed a very easy one when we started, but the further we went, the further we seemed to have still to go. At length, after a great deal of panting and blowing (for a gun and ammunition are not any great aid in climbing a steep mountain), the summit was reached. There was a great change of atmosphere at once perceptible. At the foot of the mountain it had been mild and even oppressive. Now, on the contrary there was a cold wind blowing which was very acceptable after the exertion of climbing. There was snow on one side of the mountain, although it was so very mild in the valley. I was only too glad to take some as a cooling draught, and indeed I really believe that without it I could hardly have gone any further. I looked over the inside of the back of the arm-chair, so to speak, i. e. the side facing down the valley, and it certainly looked very forbidding. It descends almost perpendicularly to the very base, and would be certain death to any one so unfortunate as to slip over the edge, for there is no grass nor anything of the kind on it, but merely

bare jutting rocks. On the very top of the mountain I found the wished-for Fir Club Moss, and also some Stag's-horn which is something of the same kind. (Both these mosses belong to the same family, the Club Moss Family, of the Natural Order 'Lycopodiaceæ.') At first there was an impenetrable cloud of mist which seemed to be coming *out of* the mountain rather than *on to* it. This soon cleared off, however, as if for our special benefit, and we obtained some of the most lovely glimpses of scenery that I have ever beheld. It was a cloudy day, but here and there the sun shone through the clouds, and the effect of light and shade was most perfect. I was surprised to see a hare get up on the very top of the mountain, (so surprised indeed that I let it get out of shot before it entered my head that I might shoot it), for it is not common to see them on such high ground. The only other live creatures which I saw were a grouse and two very large hawks. I was told that in the breeding season this is a very favourite resort of grouse, of which as many as fifty may sometimes be seen together.

Standing upon the summit of Arran, I could gather a general idea of the mountain and valley system in the neighbourhood. What struck me at once was the regular direction of the various small chains, which run parallel to each other and at right angles to a common central range. Again, many of the mountains present a rounded and smoothed character instead of the uneven and jagged nature visible in many regions. These two facts, the regular direction of the hills and valleys, and the smooth appearance of the former point to a glacial agency. That is to say, at some distant period, incredible as it may appear to some, North Wales was traversed by a regular system of glaciers. This will account both for the parallel course of the mountains and for their smoothness. The former is probably to be explained as follows. Glaciers, as you may be aware, follow very much the rules of rivers, and I need hardly say generally have one common high ground in which they rise, called the watershed. Thus, in England, most of the large rivers rise in the more elevated land in the West and flow down to the coast on the East. It was so too, probably, with the glaciers of North Wales. They had their origin in a high district and all flowed down from that place, thus running in the same direction more or less and forming the parallel valleys which we now see there. In many places there are traces of the moraines, or heaps of stones, formed by these ancient glaciers, just like those which the glaciers in Switzerland are now forming. As for the second phenomenon, the rounded nature of the hills, glacial agency is the only power which will account for it, and it is to be seen wherever glaciers have been at work. The rocks are also often scratched by the stones which are rolled along between the ice and the bottom and sides of the bed of the glacier. As I said before, it may startle those who have never studied Geology to hear that there were ever glaciers in Wales, and it is but

natural that they should be incredulous. It is a fact however which cannot well be contested, just like many other facts which at first appear impossible. It cannot be denied that the greatest changes of atmosphere have taken place in these islands at some very distant date. A few facts may perhaps prove this to you. There have been found in a fossil state the bones of the Elephant, Hyæna, and such animals, which we know could not live in a climate like that which we now have in England. Again, trees are found embedded in some of the rocks in England which now only grow in a tropical climate, as, for instance, species of palm, huge tree ferns and the like. What is more, these are sometimes found in the very position in which they once grew, so that it cannot be said that they were carried by the sea from some tropical country and deposited here. There are quite as strong proofs to show that there was once an extremely cold climate in Britain as well as a very hot one. The nature of the mountains and the scratches on the rocks, which I have just mentioned are very strong evidence and what perhaps may seem still stronger to you is that there are fossil shells found in England and Wales just like those which now exist only in Arctic seas. I think you may now feel more willing to credit the statement that North Wales was once covered with glaciers as Iceland is at the present day. There is another feature of Wales which probably is connected with this glacial action, and that is the frequent occurrence of small lakes. Professor Ramsay some time ago enuntiated a theory which certainly has probability to support it and explains what is otherwise inexplicable. His theory, briefly, is that sometimes glaciers which once formed their moraines where they ended in valleys, afterwards retired further and further owing to some changes in the temperature, while the moraines remained as they were and found a dam. When the ice was succeeded by running water with the increasing warmth of climate, this water had no outflow, and the result was *a lake*. You must please to excuse this rather long digression as it is Natural History to some extent, *i.e.*, it is to account for some of the natural appearances of the county, and it may interest some, though not all.

As for hawks, I never saw so many anywhere else, as round Esgair. In general they literally swarm ; and must, there is no doubt, do great injury to the game. The neighbourhood seems to be a resort of every kind of 'vermin,' for not only are there innumerable hawks but also innumerable magpies, jays, &c., &c. There is one animal which is shot unmercifully by the gamekeepers whenever it is seen, and that is, what they call there a Pole-cat. How far this appellation may be correct, I cannot say, but the animal was described to me (for I had not the good fortune to see one myself) as yellow and black, and much larger than a stoat, with a bushy tail. I was very anxious to shoot one or to get one by some means for our Museum, but did not succeed, as they were not to be found on our side of the valley, though not uncommon on the

other. Owls, too, though hardly 'vermin,' perhaps, are very numerous there, both the white and the brown species. Never having been accustomed to hear these peculiar birds in the night, I was quite startled on the first night of my visit at Esgair. I could have declared just at first that it was some children screaming at the top of their voices, but on listening I was undeceived. There was one owl hooting somewhere close to my window, and several others answering him in various directions, for the house was surrounded by woods. I grew rather fond of listening to them after a short time, and tried to catch, their note exactly, I certainly could not distinguish the "tu-whit, tu-whoo," of our poets, although I tried to make myself believe that that was the real call. There seemed to be no break in the middle of the hoot, but that it was continuous. It sounded something like tu-whoo-oo-oo-oo, the last note being higher than the rest, and all being piercing and shrill. Perhaps it is partly the cry of the owl, and partly its silent flitting motion, which is certainly rather ghost-like, that causes it to be dreaded as a bird of ill omen among the poor in many places. The weather was exceedingly mild during my visit, as through most of last holidays, and to this fact I was greatly indebted for being able to prosecute my botanical searches, (if they may by a figure of speech be so called), for the mosses were in perfection. As an instance of this mildness, roses in the open air were in full bloom, and we even discovered a solitary blackberry, which would no doubt have been shrivelled up and withered long before, had it been an ordinary winter. Even the denizens of the interior of the earth seemed aware of the unusual warmth, for the moles had begun to work their way up towards the hills. It is a singular fact but one which you may see taking place that these animals every winter retire to the valleys and remain there until spring when they sally forth and return to the high ground. I suppose that this is done because it is warmer in the valleys in the winter and more easy for the moles to burrow and to find worms, &c., to live upon. They had already advanced a considerable way up the side of the hill on which Esgair lies when I was there, and that was in January. I do not mean to lay it down as a Natural History fact that moles *always* seek the lower lands in winter and return to the higher in spring. But, at the same time, as this is the case at one place, it is quite allowable to suppose that it is so generally.

But everything must have an end, and so had my visit. I got into the train, and was lost in a reverie until I noticed that the hills were gradually getting lower and lower, the valleys wider and wider, and at length I found that I had left the Esgair scenery behind, and was near my own habitation.

I cannot conclude this wearisome subject without mentioning that it was my uncle to whom I was indebted for the Abyssinian panoply of club,

bow, and arrows, which you now see suspended on these walls. He also gave me a peculiar article of furniture in vogue among Abyssinian women, which I unfortunately left behind. This is a rest for the head, something like a Lilliputian bench, lower in the middle than at the ends. The ladies of Abyssinia wear very long hair, or rather I should say they take extreme care of it, and as they wear it in a mass, or a chignon, at the back of the head, they cannot conveniently lie down without great injury to the said mass. They therefore solve the difficulty by resting the neck on these little benches, so that the hair is kept off the ground or whatever it may be that they are reposing upon. I hope that I shall still be able to give this curiosity to the Society some time or other.

I shall be most happy to present the collection of mosses to the Society if they will accept it. I quite intended to name them all from the collection which I have said Mr. Bloxham had made. I found, however, that it took such a very long time to identify each species when there are so many almost the same, that most of them are left unnamed. Some Botanist will perhaps think it worth his while to do what I could not accomplish. There are some lichens also in the collection, but I was not so fortunate in them as in the mosses. There are about fifty varieties of them in the neighbourhood of Eagair, but I think I have only about twelve. Most probably it will be found that I have pressed more than one specimen of the same moss occasionally, for which and for all other errors I must beg forgiveness, hoping that the will may be taken for the deed.

You will hardly think it necessary for me, I am afraid, to apologize for not having given you a longer paper, but I may perhaps just remark that in a short visit to a place only a few hours distance there cannot be so much to see and talk about as a trip to America for instance, or to some other distant part of the world, and therefore the confined limits of the subject must be my excuse.

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There were 27 persons present: 2 Hon. Members, 10 Members, and 15 Visitors.

## MEETING HELD MARCH 5TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors :—

A collection of Geological specimens, by Mr. Piper.

A very interesting Collection of Curiosites from the first North Polar expedition, by Mr. Sawyer.

An Abyssinian Bow and Arrows, by G. E. Manisty.

A set of Maunday Money of Charles I, by Mrs. C. W. Tayler.

A Saxon Penny, coined at Cunetia, the ancient Marlborough, by Rev. W. H. Bell.

A Chinese Coin, and a Medal to commemorate the victory of the Duke of Cumberland in 1721, by — Smythies.

EXHIBITIONS.

A box of moths, by H. M. Hilton.

A lump of Silica from the ashes of a wheat stack, by the President.

H. M. Hilton then read a paper on the Classification of Moths and Butterflies.

H. Manders, H. Soames, and W. D. Harvey were removed from the list of members, in default of payment of subscriptions.

W. Mansell, Esq., Rev. G. W. De Lisle, and Messrs. R. F. Isaacson, W. Koch, G. T. Spankie, W. W. Dayman, and H. A. Evans were elected Honorary Members.

R. Rooke and D. E. Leighton were elected Ordinary Members.

There were 33 persons present: 3 Hon. Members, 13 Members, and 17 Visitors.

## MEETING HELD MARCH 13TH, 1869.

THIS was a private meeting to consider the motion of H. J. Verrall, that "Notices of Sectional Meetings be posted on the board outside Mr. Preston's Room." The motion was seconded by W. D. Fenning, and carried without opposition. A discussion about the better working of the sections succeeded.

## MEETING HELD APRIL 2ND, 1869.

There were no exhibitions, in order that there might be more time for the following paper, which was read by A. H. Beesly, Esq., on

## THREE ARCTIC EXPEDITIONS.

THE pretensions of this paper are very humble. I propose to tell you something of the objects of Arctic expeditions generally, to give you some idea of what the Arctic regions are like, and to summarise the history of three expeditions—those of Barendz, De Haven, and Kane. And let me give a hint to officers of House Libraries who may be present: if you want books of thrilling interest, books the authors of which were the actors in their own dramas, books which admit their readers to the glorious fellowship of the Knights Errant of Modern Times, let me recommend you to buy all the narratives of Polar Expeditions you can lay your hands on.

You must go back a long time with me—nearly three centuries—to the first great Arctic expedition. Its date is 1594. Many of you know something of the state of the world at that time. Elizabeth was on the throne of England, Henry of Navarre was on the throne of France, Philip II was drawing near the end of his infamous reign. If you wanted to fix the century that was closing in your minds you might do so in many ways: it was the century of the Reformation; it was the century of the greatness of Spain; it was the century of the Armada and St. Bartholomew; it was the century of the first Russian Czar, of the foundation of the Mogul Empire in India, and of the maximum splendour of the Ottoman Empire; it was the century of Loyola and the century of Luther; and, what is more to our purpose, it was the century of the rise of Holland. Philip II had had three great objects in life, one was to conquer England, another to force Catholicism on the Netherlands, another to create an universal empire in Spain. He ruined the Spanish navy by the first attempt, he ruined the Spanish army by the second, he ruined Spain by the third. He had only one quality worthy of his age, the vastness of his projects. For perhaps nothing is so characteristic, after all, of that century, as the immensity of the schemes formed and the results obtained, compared with the insignificance of the resources at man's disposal.

Men's minds were fired by the splendours of the dawn of their era. What was there too wild to hope, too visionary to dream, when Gama had found a new way to India, Columbus had discovered a new world, Magellan had found a passage through that world, which men till his time thought extended in one unbroken continent to the South Pole? And Philip, the most

powerful King of Christendom, had his dream too, a wicked dream which so mean a mind as his could never have conceived at any other period. I have said how he failed on all sides, and perhaps what wounded his bigoted soul most deeply was his failure to crush Holland.

If the Reformation was the most striking feature of the rise of religious freedom, modern political freedom may be said almost to date from the rise of Holland.

And now I have come by a somewhat roundabout way to my proper subject. But unless you understood something of the spirit of the time, you really could not understand the spirit of the first great Arctic expedition. Imagine a nation sprung full armed to freedom as Minerva sprang from the head of Jove. Imagine it in the first flush of its youth, and strength, and enterprise—a new nation in a new world.—A nation which had its home upon the waters; which while it fought Philip desperately by land, was preparing to fight him triumphantly by sea, sending forth its mariners far and wide to hitherto unknown oceans to wrest their commerce from the Spaniards and Portuguese.

And a world which was constantly being added to. The discovery of a new country in those days was little more than an improvement in the telegraph or the steam engine or gunnery in this. Talk of steam engines and Atlantic Cables! What are such surprises to the stirring hopes that fired our forefathers. If we find means of speaking to our friends over the Atlantic, they found out what the other side of the Atlantic was, and not a captain who sailed westwards but hoped he too might be another Columbus, and discover some new country and an unknown race.

And now you will not be surprised to hear that the leading projectors of the first great Arctic expedition were grave statesmen, philosophers, and merchants, headed by the leading statesman of his country, Olden Barnveld. Such men were actuated not only by speculation and ambition, but patriotism. For the whole ocean south of Spain was then a Spanish lake, the private property of Spain just as much as the Mediterranean had been of Rome at the height of her power. To poach on these preserves entailed a double danger. If the Dutch sailor was caught by the Spaniards he was at once handed over to the Inquisition. And moreover he knew nothing of the Indian or Pacific oceans; the Spaniards alone had practical acquaintance with those seas. Hitherto the Hollanders had traded with the east through Spain, soon they were to force their way into this great private lake, and make those oceans the common highway of the world. But just at the close of Philip II's reign they were compelled to renounce the carrying trade with Spain, and they had not yet found out that they could perform the whole voyage for themselves.

What then was more natural in such an age than that they should determine to find a new way to the golden countries of the East? Geography was then flourishing in Holland: Mercator was a native of Leyden, and his great maps were published at Amsterdam. Another ardent geographer was Peter Plancius of Amsterdam. There was plenty of science to stimulate discovery,—there were plenty of brave seamen ready for any venture,—there were plenty of rich merchants to back any venture with their purses. The Spaniards locked up the whole south ocean. Well, said these Hollanders, we will go across the *North Pole* to Cathay. There you have the origin of Arctic Expeditions; It was exactly the same idea which Cabot had entertained nearly a century before when he tried to find a passage N.W.,—and when we think of the disinterested chivalrous ideas connected with the name in our minds, ideas which in our age have filled the souls of men who would have been Knights Templars or Hospitallers in the Crusading age, and knights of the Round Table in the age of legend, we can hardly imagine that they first dawned in the minds of sober commercial citizens.

But so it was. Republican commerce has always gone hand in hand with patriotism and daring; and commercial Holland was the pioneer in the path which has since been trodden by so many noble Englishmen and Americans, whose deeds have given the lie to Burke's lamentation, that the age of chivalry is dead.

And now that the expedition was resolved on, who were to be its leaders? What was to be its course?

Cathay is a name loosely used and sometimes means the northern part of China, sometimes Ceylon, the Spice Islands, and India generally—what in fact is meant by the expression "farthest Ind." These Dutchmen believed that they could save 10,000 miles by sailing north instead of going round by the Cape of Good Hope. There were no maps, you must remember, of the unknown regions beyond the northern headlands of Sweden. Plancius, Prince Maurice, Olden Barnveld, and others thought that the way to Cathay was north east. In this view they were supported by the greatest traveller of the time, a Dutchman named Linschoten. But though they were all agreed so far, there was a difference of opinion; one party was for sailing between Nova Zembla and the coast of Muscovy, which they said would be found to trend in a S.E. direction, and so reach Cathay. Plancius and others, and among them the brave Barendz, wished to sail north of Nova Zembla leaving it on the east. Some said that four great straits would be found on the coast of Muscovy communicating with the Arctic seas. Others said that in those seas round the pole reigned perpetual summer, and that a race of virtuous and happy beings dwelt there. Others peopled it with monsters with hoofs of horses and dogs' heads, and with no clothing but their own long ears which they coiled round

their limbs and bodies; and it was considered pretty certain that a race of men with no heads, and eyes in their breasts, were the wisest of their tribes. You know how Shakespeare has in two of his plays alluded to such notions. These races it was believed lived in eternal fog and tempest, and died all of them every winter, to spring up again like vegetables next year. Volcanoes of fire, and mountains of ice would daunt the voyagers, but in time they would find the happy haven, and discover the golden glories of Cathay.

Amid such prognostications Barendz and Linshoten set out in June 1596, not in steamers of iron with perfect mathematical instruments, portable soups, patent stoves, extracts of meats, &c., but without coffee or any tea, in ships of a hundred tons burthen, built up like a tower at stem and stern, bulging out clumsily amidships, with the roughest kind of fircams, the rudest of implements, and the coarsest of food. They were rich only in one thing, they drank no ardent spirits, and the absence of this served them in as good stead as the presence of many luxuries—it kept them in health and it kept them from mutiny. So prepared they set out for unknown seas and realms of fable, to grapple with beast, or monster, or storm. They set out in June, they were back again in September. Barendz had sailed to lat. 77, to the extreme N.E. of Nova Zembla, which was then mapped out for the first time. He had been nearly wrecked and had fearful encounters with walruses which they had never before seen. Linschoten went about 150 miles north of the Waigatz where he was stopped by ice.

Not a very encouraging result this you will think! Linschoten and the States General thought otherwise. So glowing was the picture painted by Linschoten that it was supposed that the highway to Cathay was found. The very next year another expedition was sent out equipped — how do you suppose? With preparations for the perils of the frost or the ice, or those *monsters with almost human faces, as large as an ox, and with two terrible tusks? Nothing of the sort. It went laden with tapestries, linen, and broadcloth, for sale in Cathay, and a yacht went with it to sail back with the tidings when the few merchantmen had fairly turned south round Muscovy.

Alas for this sublime credulity! The only discovery made was on Staten Island where they landed to pick up what they described as "a kind of diamond very plentiful on the island." While two of them were thus engaged one felt himself twitched behind it. "What are you pulling at me for mate?" he said. The next moment his head was off, and his supposed mate, a long loan white bear, was sucking his blood. Twenty of his companions charged the bear, which however killed another of them, and half ate him during the fight.

*Monstra maris ambiguas hominum ac beluarum formas. Tac; An; II. 24.

They managed to kill him at last with a snaphance, (how the very name shows their poor equipment) and with the skin and the Staten diamonds they came home, for the ice stopped all further advance.

The States General were bitterly disappointed, but they offered 25,000 florins to whoever should discover the North Passage.

The very next year Barendz set out again, he had two brave comrades, John Cornelius Van der Ryp and Heemskerk, on whose tombstone is this inscription: "The man who ever steered his way through ice or iron."

They sailed on the 18th of May, N.E. by N. On the 15th of June they saw immense flocks of white swans, as they thought, swimming towards the ships; the swans turned out to be icebergs. In two days more they came to water green as grass, so thought they were near Greenland.—On the 9th of June they discovered an island, where they had a great fight with a polar bear, and called it Bear Island.—On the 21st of June, they arrived in 80th degree of latitude, and called the land which was covered by eternal snow and mighty glaciers, by the appropriate name, "Spitzbergen." Here they made an interesting discovery: rowing up a wide inlet they found myriads of the geese which visit Holland in summer, sitting on their eggs. This dissipated the hitherto prevalent belief that these geese were hatched from eggs which grew on the trees in Scotland. The diarist of the expedition says, quite gravely, "we now see that quite the contrary is the case." They were driven south by the ice again and once more reached Bear Island on July 1st. Here they parted company; Cornelius Ryp sailed north again; Barendz for the N.E. of Nova Zembla. They came to anchor off an inlet, where they had erected a cross in the preceding voyage. Here, as if in mockery, they saw two great polar bears standing on their hind legs beneath the cross. The boatmen were running off, but Heemskerk said, "the first man that runs shall have this boathook of mine," so they slowly retreated, Heemskerk bringing up the rear.

On the 15th of August they reached the isles of Orange, extreme N.E. of Nova Zembla, and seeing nothing but open sea were full of joy, the first who saw it pulling fast back to ship not knowing how to get quick enough to tell William Barendz. They knew nothing of what I shall presently speak about, the influence of the Gulf Stream. The ice soon stopped their progress eastward and all that August they remained struggling with it, the ship sometimes rearing in the air, her bows propped up by large blocks till she actually sat erect on her stern, then heeling over on her side and anon righting again as the ice floated off. All the while a blinding snow storm raged, the ice cracking and groaning, the ship creaking, the wind howling, till, said the Diarist "it was enough to make the hair stand on end."

The ice was here, the ice was there,
The ice was all around:
It cracked and growled, and reared and howled,
Like noises in a swound!

By the month of September the strife was over. They were ice-bound on the shores of Nova Zembla. Cheerfully they set about preparations for the winter. Luckily they found plenty of driftwood with which they built huts, and brought stores from the ships. For six weeks they laboured amid a hurricane of wind and snow, and tormented by bears. They could not leave a meal-tub for a moment without a bear's muzzle rummaging its recesses, and sometimes they had to run for their lives, throwing sticks and stones at their pursuers who stopped to play with them like dogs with children. They killed one, disembowelled him and stuck him up near the house on his legs where he was frozen and snowed upon till he became of monstrous proportions, a bear of ice. The carpenter died before the house was built and they could dig no hole to bury him, so they laid him in a cleft of the ice where the snow soon covered his body. On the 12th of October the house was done, and they had a house-warming, setting up a gigantic icicle for the May pole which it was their national custom on such occasions to rear in front of the house. The first night they slept there a bear took possession of the ship. On November 4th the sun rose no more.

You know what the appearance of the sun is in those regions.

To a person at the North Pole the sun appears to sweep horizontally around the sky every twenty-four hours, without any perceptible variation during its circuit in its distance from the horizon. On the 21st of June it is 23 deg. 38 min. above the horizon—a little more than one fourth of the distance to the zenith, the highest point that it ever reaches. From this altitude it slowly descends, its track being represented by a spiral or screw with a very fine thread, and in the course of three months it worms its way down to the horizon which it reaches on the 23rd of September. On this day it slowly sweeps around the sky, with its face half hidden below the icy sea. It still continues to descend, and after it has entirely disappeared it is still so near the horizon that it carries a bright twilight around the heavens in its daily circuit. As the sun sinks lower and lower, this twilight gradually grows fainter, till it fades away. On the 20th of December the sun is 23 deg. 38 min. below the horizon, and this is the midnight of the dark winter of the pole. From this date the sun begins to ascend, and, after a time, his return is heralded by a faint dawn, which circles slowly around the horizon, completing its circuit every twenty-four hours. This dawn grows gradually brighter, and on the 20th of March the peaks of ice are gilded with the first level rays of the six months' day. The bringer of this long day continues to wind his

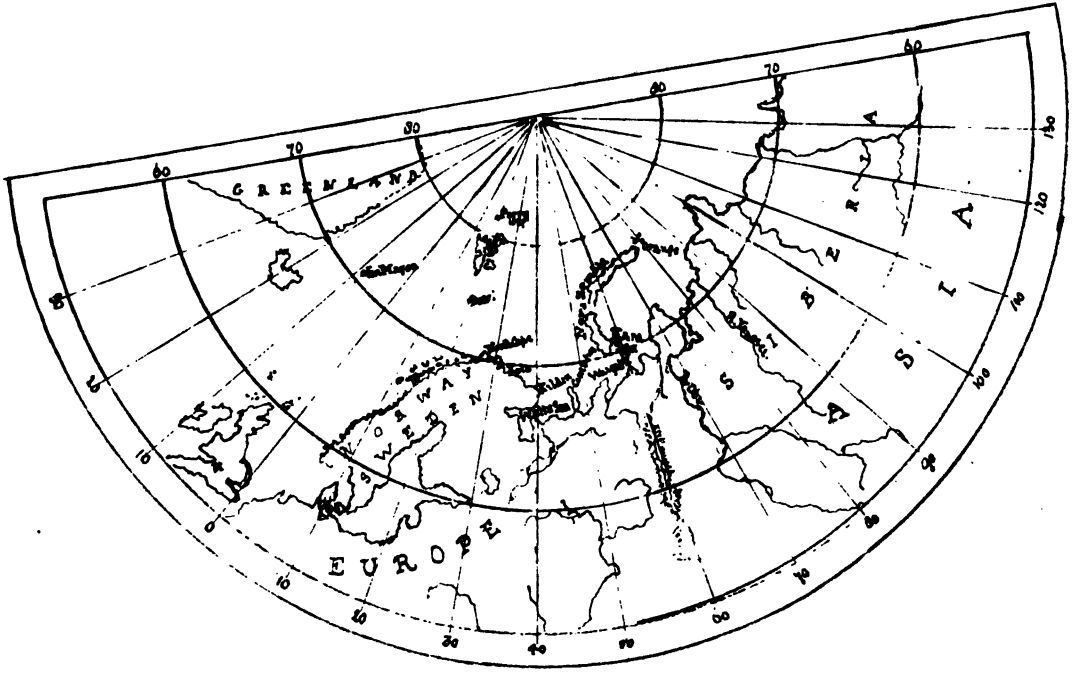
spiral way upward, till he reaches his highest place on the 21st of June, and his annual course is completed.

With the sun the bears went, but white foxes came, which they caught in traps and ate, dressing themselves in their skins.

The cold now became appalling. Their clothes froze. Their shoes became like iron. The clocks stopped. The beer became solid. The wine had to be melted in saucepans. The smoke blinded them. Fire would not warm them. The snow fell all December. They could scarcely dig themselves a way out of the house. They shut up the chimney one night and were nearly stifled to death. Glad enought they were that one had strength enough to let in their kind enemy the cold air. On twelfth night they had a feast, a little wine, 2lbs. of flour made into pancakes with oil, and one biscuit per man, which they sopped in the wine. "We were as happy," says the diarist, "as at a splendid banquet at home. We imagined ourselves in the fatherland with all our friends." The Gunner was proclaimed monarch of Nova Zembla for the night.

On the 24th of January they saw the sun again, but though the long dark night was over, the cold was as bad as ever, and the bears came back. Three of them fed on bear's liver and were nearly poisoned. Spring came, but it was spring only in name. Another of their number died. They hollowed out a grave in the frozen snow and sung a psalm over him, but before they had done they were nearly all frozen to death. On the 14th of June they deserted the icebound ships, and set off in two boats, Heemskerk in one, Barendz in the other. Barendz was ever hopeful. On the 20th June, rowing in an open boat on that awful polar sea, he was too weak to sit up, but lay studying the charts he had made, and prattled how in his next voyage (his next voyage Heaven save the mark!), he would steer N.E. from the North Cape, and so on. Then the boatswain of the other boat told him that Claus Andersen could hold out only a little longer. Then said William Barendz, "Methinks I too shall last but a little while. Give me to drink." He drank, turned his eyes on his friends, and died.

In sore dismay at the loss of one on whom, to use the diarist's words, "they had counted next to God," his comrades struggled on. They had by this time again doubled the N.E. of Nova Zembla, and were sailing southwards and on the 27th they doubled Cape Nassau. All east of that point is named Barendz Land, and it has never been entered from that time to this day. On the 1st of July one of the boats foundered. On the 27th they had reached Kostin Shar; and on the 18th of August, Candenoes (Kanin Nos) at the mouth of the White Sea. Crossing the sea they reached Kildin. On the 25th one of the party set out with some Laps to look for some ships which they were told were up the river at Kola. On the 29th the guide came with a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letter from a man who promised to come with food immediately. He signed himself John Cornelius Ryp.

They all fell to wondering who this Ryp could be, and strangely enough never guessed it could be the same man who had parted company with them at Bear Island, who had only gone northwards as far as Spitzbergen again, had then gone home, and was now on a trading voyage at Kola. The story of this voyage is over.—On the 1st of November, Barendz's men stood before the magistrates of Amsterdam in their robes of white fox skin, having been absent 17 months, having penetrated 80 degrees north, (no one to this day has penetrated two degrees more north,) having carefully mapped out, and named all they had seen in spite of all their sufferings; and having never once lost heart, or once violated discipline. But the bravest of them was not with them. The body of no nobler hero was ever committed to the cold waters of that sea where none but heroes sleep.

As this attempt to reach Cathay was to the N.E., I may here say that no ship sailing from Europe has ever got farther than the sea of Kara. The rest of the northern coast of Asia has been tracked by Russian exploring parties coming from inland or from Behring's Straits, but the northernmost point of Asia, the North East Cape, (Severai Vostochnoi) no boat or ship has ever doubled to this day. When Behring's straits were discovered A.D. 1740, the North East Passage was proved to exist, that is, it was proved that you could sail, if it were not for ice, starting north east, from England to India, by keeping to the coast of Asia.

In short if any one is puzzled by the terms N. E. and N. W. Passage, let him remember that a sailor starting from England and tracing the N. coast of Russia, till he could steer his ship south, would have discovered the N. E. passage to India; in the same way by tracing the N. coast of America till he could sail south he would have discovered the N. W. passage. We now know that there is only one passage (whether he should sail N. W. by America or N. E. by Russia), and that is through Behring's Straits. What we have to discover still is whether we can sail right across the Pole to Behring's Straits, instead of taking either of these circuitous routes. And I may as well describe to you here what this great region of the Pole is. You see that roughly speaking there is a great circle unexplored, of some 6000 miles in extent, with a surface one third larger than the continent of Europe. Now what does this circle contain? Some say an ice-bound sea, or ice-bound land. Others say that there is only a ring of ice round the continents of Europe and Asia, and that if you could cross this ring you would come to an open sea round the North Pole, and as its climate would be warmer you might find a new country with an unknown race of men dwelling on it. By and by I shall have to tell you of men trying to cross this ring to the North Pole. I have already des-

cribed how this ring was traced to the North East. How it was traced to the North West many of you know. It was Sir John Franklin's party who traced it in the year 1848, almost a century after the N. E. passage had been ascertained. Sir John Franklin started in 1845, and, as he never returned from his expeditions it is only through records discovered in King William's Island that we have found out his success and his sorrowful fate. On the 22nd of May, 1850, Lieutenant De Haven set out from New York, being commissioned by the American Government to go in search of the missing ships. I had intended to tell the story of this expedition at length, but time presses and I can only say a few words about it. Here you see Davis Straits. North is Baffin's Bay. More north still is the north water. Anyone crossing from the Greenland to the American coast below 68 degrees of latitude takes what is called the South passage. Anyone coming between 68 and 70 degrees takes the middle passage. Anyone keeping close to the Greenland shore and crossing over above 74 degrees takes the north water passage. This north water is the freest from ice of the three, but before it can be reached, a mysterious region of terrors—an indentation of the Greenland coast—called Melville Bay, must be crossed.

This expedition had most glorious weather, as they tried in July to make the middle passage,—eternal sunshine, bright as in the Bay of Naples, and, owing to refraction, visions of fairy land. Just as when you look into clear water you see the clouds reflected and figures imaged again, only upside down, so that, as you stand at the edge, the soles of your feet seem to stand on the soles of the feet of your shadow, so they saw beautiful icebergs like cathedrals or grottoes or monuments, fired with every hue of unimagined splendour, and above them other cathedrals and monuments reversed. In the winter the whole bay is ice. The short arctic summer and the currents break up this winter pack. But in the middle the straggling fields of ice reunite into a sort of patchwork of ice—soft ice, hard ice, thick ice, thin ice, fragments of ice, and floes or fields of ice. Where two fields have been forced together the thinner ice is forced upwards and breaks into great piles called hummocks. This middle pack varies in its position, a N.W. wind drives it towards the Greenland coast, a N.E. wind to the American coast, but it nearly always chokes up most of Melville Bay. On the threshold of this bay they got stuck fast in the middle ice. There was nothing for it but to 'warp' and 'track.' A sailor gets out of the ship with a great hook or ice-anchor and plants it well a-head near a crack through which they hope to force the ship. I will give you a specimen of the sort of work this is. A man named Costa was sent to plant an anchor in a berg, but as he planted it the berg split with a noise like thunder, and a piece twice the size of the ship broke off, and Costa disappeared in the chasm.

Luckily as the berg came up it brought him with it and De Haven picked him off. When the anchor is planted, all hands heave at the hawser till the crack gives way and admits the ship, then another anchor is planted, and warping or the same process only easier, goes on. At last they get into a tolerable channel where however they cannot sail. A party of men get out and are harnessed to a line with which they go off by the edge of the ice, hauling the ship,—this is tracking. To show you what hopeful work this is, take this entry in Dr. Kane's diary: "July 14th and 15th, the American Expedition advanced half a ship's length," "July 22, advanced two yards." They managed at last to get across and cruised for a time with the English squadron off Griffith Island. Here they found some of the graves of Sir John Franklin's party. Dr. Kane, De Haven, and Captain Penny were talking over their plan of search one day when a seaman ran to him, calling "Graves! Captain Penny, graves! Franklin's winter quarters!" Imagine the thrill that ran through them. But soon afterwards De Haven was driven to sea by a storm and getting nipped by the ice, drifted slowly up Wellington Channel. From September 14th to June 8th of the following year they were perfectly helpless, drifting first to the N.E. up Wellington Channel and then back again into Baffin's Bay. It must have been weird work this slow mysterious drift, the cause of which was quite hidden from them.

But I shall only give you one or two incidents of the voyage. First imagine, if you can, the cold. The sun was soon gone. Some of us think ourselves very heroic if we get out of our warm beds at sunrise in October, and rushing down to the bathing place immerse ourselves for a short second under water just glazed over with ice about as thick as a piece of goldbeater-skin. These men had no sun; when they got a ducking in the water, as they did, some of them, in carrying the ice-anchors every day, the water froze on their clothes as they came out. In the sleeping room one night the thermometer was 16° above zero, and they had no fires when it had fallen to 11° below zero in the open air. Now the freezing point as you know is 32 above zero, so when the thermometer was 43 below freezing point they had no fires. Think of sitting in such cold weather to watch for a shot at a seal. And don't think this represents the lowest cold they went through. On February 6th the mercury in the thermometer froze, its parting record being 42° below zero, that is 74° below freezing point. In December the floes suddenly began to squeeze the ship and lift her bodily upwards till the stern mounted high in the air, and the bow pointed downwards, and for six months afterwards she remained in that position, so that to go from one end of the ship to the other was like walking up a hill. They of course thought she would heel over at once and the boatswain cried out to stand from under. At this moment one of the officers remembered that a fire had not been put out, and rushing on board to see to it

found the officer who had been on watch duty when they left the ship, calmly eating his dinner, and the steward as calmly waiting on him. "You were a meal a-head of me," he said, "You didn't think I was going on the ice without my dinner!"

Before dismissing this expedition I may say that when after their long drift they at last got rid of the incubus of ice clinging to them, and reached Godhaven they only stayed there three days and once more turned their ships northwards to resume the search.

Let me here say a word about Arctic currents. I need not apologise for ignorance on this subject, it is an obscure subject to the most scientific men. But you are constantly hearing about the Gulf Stream, and it is a subject of speculation whether its course has not been altered lately so that it has come more directly towards our shores. Now what is this Gulf Stream? I give you one theory about it without pretending to say it is correct. According to this theory it rises in the Gulf of Mexico, flows north like a mighty river of warm water to the coast of Newfoundland, where it turns to the east and flows between Iceland and Ireland. Is is then supposed to go along the west coast of Nova Zembla, and to turn off again, perhaps at the N.E. Cape into the Arctic sea, and this it is supposed makes an open sea round the North Pole. There are counter currents also—one comes from north to south along the coast of Norway—another along the east coast of Greenland round Cape Farewell, and northwards again up to Melville Bay. But the great current down Baffin's Bay and Davis' Straits is from north to south and this current meets the Gulf Stream at Newfoundland. It is possible that the Gulf Stream, rising to the surface in the Polar Sea, causes the current down Kennedy Channel, Smith's Sound, and Davis' Straits. The water of the north Atlantic is thought to be less salt than that of the south, and it is this greater density which is supposed to be the cause of the Gulf Stream rushing up from the Gulf of Mexico.—And now I hope I have made the matter tolerably clear, and I can proceed to the most wonderful perhaps of all Arctic Expeditions, that of Dr. Kane in the year 1853.

The expedition commanded by Dr. Kane sailed on the 30th of May, 1853. There was only one ship, and that was our old friend the Advance, one of De Haven's ships in the years 1850 and 1851. The only rules for the ship's company were—1st, absolute obedience to the officers; 2nd, abstinence from all intoxicating liquors except when regularly dispensed; 3rd, habitual disuse of profane language. The simplicity of these regulations were characteristic of the commander. I shall not be able to say much of Dr. Kane personally, and indeed the best praise of such men is to record their deeds. Elaborate eulogies, except from the lips of genius, are almost always vulgar. I have seldom read anything in worse taste than his biography by Dr. Elder. If you

wish to know him personally you had better read his narrative, which in my estimation ranks in interest as a boy's book side by side with Robinson Crusoe. He was a small man weighing less than 7 stone. He was one of those men whose bodily presence is weak and their speech contemptible, who at a right moment change the faith or fate of a world. No better description of him than can be given than in those hackneyed lines—

'A fiery soul which working out its way
Fretted the pigmy body to decay.'

He died when he was quite young. He was ill all his life. He never went out to sea without being horribly seasick all the time. Yet his voyages took up half his life. He travelled all over the world, crowding into his brief span of existence, adventures, escapes, and hard work, sufficient to fill the lives of a hundred other men. I think hero-worship a foolish creed, but of the half-dozen men of this century it would have been worth while to go many miles to see and hear, one of them certainly was Dr. Kane. He was accompanied on this cruise by two of De Haven's men, Brooks and Morton, two gallant men who stood staunchly by him through every danger. One of them, Morton, after the Expedition came back, attended him to England and was with him nursing him when he died.

The plan of the Expedition was to go to the north of Greenland and there make sledge expeditions in search of Sir J. Franklin east and west over the ice in co-operation with the Esquimaux. They sailed May 30th. When they got to Melville Bay, July 27th, they found it so clogged up with ice that Dr. Kane determined instead of keeping to the shore to double the bay. It was a bold move, but it was quite successful, and by boring through and skirting the middle pack, he safely reached the north water on August 3rd. Leaving Cape York and passing Conical Rock August 5th, Hakluyt Island August 6th, they were in sight of the two headlands of Smith's Sound—Capes Alexander and Isabella, and on August 7th built a cairn and left a boat and stores on Littleton Island. They proceeded northwards slowly, reaching Refuge Harbour on the 8th,—out of the harbour on the 10th. Mr. Sontag who planted the anchor was carried away on drifting ice, and lost for several hours. They were dreadfully embarassed by their fifty big Esquimaux dogs ravenous for food. One day they tried to eat a whole feather bed, another one of them gorged two big bird's nests, stones, feathers, filth, and moss, a peckful at least. When they came to a floe they would rush off in a pack to hunt, and could scarcely be got back to the brig. In this way they lost one. They were anchored to an islet (Godsend Ledge) when a hurricane came on, August 20th. They had three hawsers. First the six-inch hawser snapped. In half-a-minute, twang twang, went the whale-line. The great manilla 10-inch cable held them a while longer, its deep aeolian chant swelling through all the rattle of the running

gear and moaning of the shrouds. It was its death-song. The strands gave way with the noise of a gun, and in the smoke of the recoil they broke loose in the teeth of a furious gale and a driving torrent of ice. They dropped their heaviest anchor but it snapped off at once. On one side of them was ice thirty feet thick which scraped the ship's sides and sometimes rose over the gunwale and deposited half a ton of ice at a time on deck. On the other were great bergs bearing down on them so that they looked to be crushed between the two; but they fastened on to a berg which towed them like a noble horse, faster than the pale horse of Death following them through the passage when it was only forty feet wide. On the berg went, ploughing through the smaller ice, tossing the spray up scornfully, and hauling the boats from the davits they grazed through into open water. The little Advance had borne them through it all, as if she had a charmed life. They were now nearer the shore off C. Cornelius Grinnell but the storm still raged and being nipped by ice the ship actually was driven up the inclined face of a berg as if by the pressure of a steam engine amid the breathless silence of the crew. But for the groaning of the timbers and the moaning of the floe, you might have heard a pin drop. Then she quietly settled down into her old position as the floes relaxed. The whole crew though terribly harrassed behaved with the greatest bravery. Four times some of them were carried away by drifting ice. On the 22nd the storm lulled. They went tracking along the shore-ice four days more, and then the hearts of the crew sank, and with one exception, Mr. Brooks, they were for going south again to winter, as they could get no farther north that year. It was at this time Dr. Kane noted that grog was useless except as a stimulant for the moment. Hot coffee on the other hand gave them real and enduring strength and they always had recourse to it. Dr. Kane had no idea of giving in. He set out on a trip north, to examine the coast, starting in a boat which at high tide they hauled on to the ice-belt, and then pushed on in a sledge, the cliffs over-hanging them, the ice under their feet, and the sea roaring below. This ice-belt had ravines in it through which torrents poured down. In one of these ravines the tide came over at night and they had to hold their buffalo bed-clothes above their heads, and stand up in the water till it went down. In five days they made only forty miles, so leaving the sledge they walked on, and on the 5th September, came to Mary Minturn River, and were lulled by the rare music of running water. At last they came back, for Dr. Kane could find no better position for the brig than where she was already.—They warped in between the islands of the bay into Von Rensselaer Harbour, a snug resting place, and from that harbour the brave little *Advance* never stirred again.

They were now in for a winter on the ice, and set about landing stores, building an Observatory, taming the dogs, and killing the rats aboard ship.

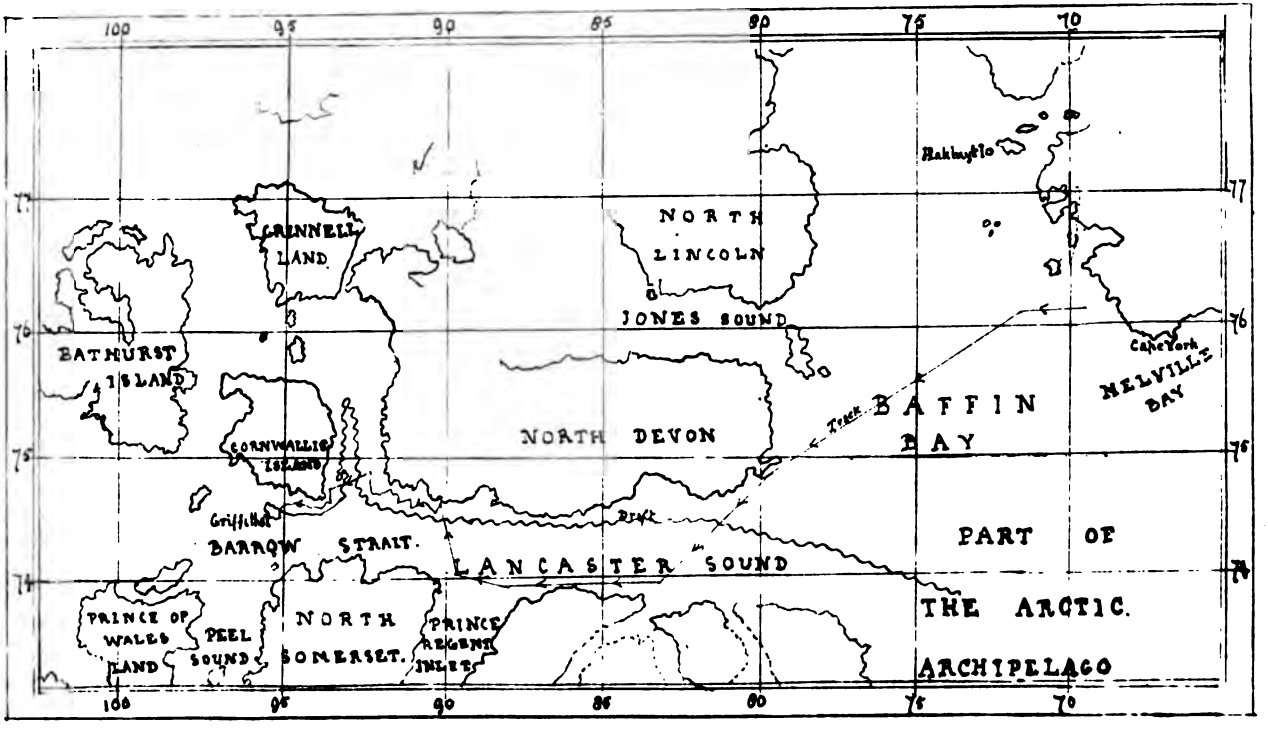
They nearly killed the cook Pierre Schubert in doing so. Dr. Hayes burnt a quantity of charcoal into which Pierre ventured in order to finish a soup. Morton fished him out half dead. The deck took fire during the operation. Dr. Kane discovered it and told Brooks, Ohlsen, and two others, and they put it out with difficulty. The result of all this smoking was the carnage of 28 rats. The dogs made short work of their carcases. These hungry animals now began to increase in numbers, but the mammas ate their puppies with relish and the others were made into mittens. The whips used to them is six yards long with an handle of only 10 inches, but a driver can flick any part of any dog in a team of a dozen. When Dr. Hayes was out, his driver pointed to an unruly leader and said, "You see dat dog, I take his ear off," and with a crack he whipped off the tip of one ear. You may imagine it is hard work to wield such a whip. Dr. Kane learnt, and when he came home from this voyage used to amuse himself with the two leaders of his old team he had brought home, Toodlamick and Whitey, before breakfast, he cracking the long thong and they in their fat and hairiness defying it but howling as if they felt it and always enjoying the game as much as he did.—When they took a tent ashore and slept in it the dogs slept with them, and the men were only too glad to lie among them for warmth. Dr. Kane sent out September 20th a party to make a depôt of provisions to the north with a view to future explorations. The party came back October 15th. They had had their adventures. McGary the joker of the ship, and one of the bravest of them had caught a fox. He couldn't skin it so tried to pluck it, and his fingers froze to the skin. They had built cabins and cachéd stores under them at Cape Russell, in Dallas Bay, and McGary Island.

The winter was now fairly upon them, a winter of 140 days without any sun, and everything portended a winter of more than usual severity. Poor Hans grew home-sick. He had left a sweetheart at Fiskernaes and packed up his bundle to go home. But Dr. Kane gave him first a dose of salts and then promotion and Hans recovered his peace of mind. Morton started on Friday 26th to pick up some articles previously left behind, (in cold so intense that whisky froze in a bottle which one of them had as a pillow) and came back on Sunday after marching sixty-two miles in darkness at noonday so deep that you could not see fifty paces ahead. Dr. Kane and Morton afterwards marched eighty-five miles in three consecutive marches. They amused themselves with the walruses and the dogs. Walruses in summer are to be found basking on rocks a hundred feet above the water. They climb up by the help of their long tusks. They also swallow stones, and sometimes the men found a peck or more of shingle which they had deposited on the ice. Their funniest dog was named Grim. He was a great hypocrite and timeserver and always managed to carry off the best morsels

and shirk all work. As soon as the dogs were well, off he would go and hide till the sledge was away when he would emerge with many deprecating wags of the tail. At last Dr. Kane thought his health demanded exercise. So he had him caught and harnessed. The sledge went a mile, when Grim jerked his line, snapped it, and was never seen again.

Scurvy now came on the crew and, worse even than this, the dogs began to go mad and die off one after another. The darkness maddened them. They would eat ferociously and then run blindly about the deck snapping at everything till they dropped down or were shot. In vain Dr. Kane made soup of their own puppies for them and swaddled them in flannel. Of his fifty dogs he had only one left in March.

The cold was fearful—70° below freezing point. Only one barrel of potatoes was left. All their fresh meat was gone. Only Pierre and Morton were without scurvy. All were pale and haggard. Yet on the 20th of May Dr. Kane thinking ever of the search for Franklin sent out another depôt, giving them his last two bottles of port and a wedding cake of his brother's. They started in a sledge, made by Petersen too heavy for the work, so that they only got five miles the first day. Nothing would convince Petersen that it was the sledge that was in fault, so Dr. Kane prepared another sledge, waited till night, started for the camp of the sleeping party, unloaded their sledge and loaded the fresh one, then with the words, "Now boys when Mr. Brookes gives his third snore off with you" they ran away with the new sledge and its load some distance, waking the sleepers with three cheers to show the success of the experiment. On March 31st Dr. Kane wearing poor Flora the late leader of his team in the shape of a pair of socks, started off for a drive and was nearly killed. The dogs were required to leap a chasm to get up from the floe to the ice foot. They failed and went down sixteen feet into a roaring drift of broken ice. When Dr. Kane got down they nearly killed him with their caresses. And now comes an episode shewing what manner of man Dr. Kane was more than any panegyric could do. A wonderful, I may say an altogether unparalleled instance of a frail body forced by an unconquerable spirit into apparently impossible exertion. It was the same evening, March 31st. Dr. Kane though taking daily drives, was so scurvy stricken that he could not rise in the morning often without help. As the crew of the brig sat round their stove working, three of the depôt party, Ohlsen, Sontag, and Petersen staggered in. They were swollen, haggard, and almost unable to speak. They had a fearful story to tell. The rest they had left in the ice, risking their own lives to bring the news. Brooks, Baker, Wilson, and Pierre were all frozen and disabled. Where? They could not tell. Sontag and Petersen lost their faculties at once. Ohlsen with some little sense still remaining in him was fed, strapped in a fur bag on a sledge, and Dr. Kane and

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eight feeble men started off with only the clothes on their backs, when the thermometer was 78° below freezing point. It soon sank to 81° below, and worse than all a north wind set in. Ohlsen fell asleep and was half deranged when he woke. They could melt no water, and the snow when they putit to their mouths was like caustic and covered them with blood. There was nothing for it but to walk on and on and on. The strongest of the party, joking McGary, and Bonsall began to have trembling fits. They staggered on blindly not knowing where they went, having been eighteen hours without water or food. At last Hans saw a sledge-track. They followed it and came in sight of the American flag on a hummock, lower down a small masonic banner on a tent pole buried in a snow-drift. It was the camp. They had reached it after an unbroken march of 21 hours. Dr. Kane's companions drew aside delicately to let him go in first. As he crawled in the four poor fellows hailed him with joy. "They knew he would come, they had expected him," and he burst into tears.—Tired as they were, there was no time to lose. The sick were sewn up in bags, which took four hours, and they started back again, the thermometer being now 88° below freezing point.—In six hours they made six miles which Dr. Kane called "vigorous and cheering progress."—But when they had made nine miles their energies suddenly gave way. Bonsall and Morton came to beg to sleep a little. They were not cold they said, they only wanted to sleep. Presently Hans sank half stiff in a drift. Thomas Hickey followed him with eyes shut and tongue almost dumb. Then John Blake, one of the two bad fellows of the crew, threw himself down and refused to stir. Dr. Kane (think of it!) wrestled with them, boxed, ran, jeered at them. It was all useless. There were strong men there, and brave men, men like Morton, stalwart, faithful, and gallant sturdy as oak, true as steel. But there was only one hero, the frailest, feeblest, sickliest of them all. It was necessary to encamp. McGary was left with the tent into which the sick were put, and the others scrambled in and Dr. Kane set out to a half-way tent they had left when coming, with one man Godfrey, who was the other bad fellow of the crew but on this day atoned for many an after-fault. How they got there they did not know. It was nine miles. It probably took them four hours. They were in a stupor. They both remembered seeing a bear walking leisurely ahead of them and tearing up a wrapper McGary had left on the ice. When they reached the tent it was only just in time to save it from the same treatment. Without speaking they crawled into their reindeer bags and fell asleep for three hours.—When Dr. Kane awoke, his beard was a mass of ice frozen to the buffalo skins. Godfrey had to cut him out with his jack-knife. They melted water and had soup ready for the others when they came up. And then they all set out again for the brig.—It was a rough road over hummocks and drifted snow. They all became desperate.

They ate snow and, their mouths swelling, they became speechless. They fell down in the track and slept, and wonderful to say it did not kill them but strengthened them, and Dr. Kane allowed each to take occasional naps of three minutes. And so they reached the brig without a halt, they believed, at 1 P.M. They believed. For they were quite incoherent, when they came. Dr. Hayes met, as he says, a ghastly party. They gave him no recognition, but only a wild vacant stare. Their beards were ice. They were covered all over with frost. They looked like old men bent down in years. Dr. Kane alone seemed sensible, but when he had seen the sick cared for and lain down in his cot he called the doctor and ordered him to call "all hands to lay aft and take two reefs in the stove pipe," so that Dr. Hayes submitted respectfully that he too must have been wandering. It was a long time before they got over the expedition. One of them, Baker, soon died. He was quite young, nineteen or twenty and a devoted admirer of Dr. Kane, who was deeply affected by his death. He says "I never gave him a hard word or a harsh thought." Prostrated by illness and grief for Baker, and lying exhausted in his bunk he heard one day, a week later, a shout from McGary "Esquimaux alongside. Quick as a flash he was on his legs and dressed, and the only words he said were "I'll make my journey now." Think of that! He was even then dreaming of Franklin. In a few seconds he was on deck, a sick man no more, and in half-an-hour had purchased a team of dogs for a few needles.

The chief of these Esquimaux was called Metek, big, strong, and full of fleas. He and his friends came on board quite fearlessly, and sat down comfortably to a little meal of some 5 lbs. per head of raw walrus meat, their manner of eating being to put a big slice into their mouths, and cut it off level with the lips and then gorge it, then sleep a few winks, and repeat the process. On a subsequent occasion Hans told Dr. Kane what he had seen a baby eat, "Cappen Ken even the children ate all night! You know the little two year old Awiu carried, the one that bit you when you tickled it, well that baby cut for herself with a knife made out of an iron hoop, and so heavy that it could scarcely lift it, and cut and ate, and cut and ate as long as I looked at it." "Well Hans" said Dr. Kane, "you are a truthful man, how much do you think it ate? Hans pondered and said he couldn't tell, but "I know this, it ate a 'sipak' as big as its own head, and three hours after when I went to bed it was cutting off another lump and eating still."

With the new dogs Dr. Kane organised a new expedition, though, as he says, though they were eighteen souls, they were certainly not eighteen bodies now on the brig. McGary was sent a-head. Dr. Kane and Godfrey followed after. It was to be the crowning expedition of the campaign to penetrate to the north. They set out April 26th. On the 28th they caught up Mc. Gary. They found that the bears had robbed the cachés, twisting up the iron in play

into balls and sliding down on the rocks on their haunches as was to be seen by the hair they had left in the process. It was probably this dreadful blow as much even as his weakness which upset Dr. Kane. Off Cape James Kent he suddenly fainted. On the 5th he became delirious, and they bore him back to the brig apparently dying. Dr. Hayes thought he could not possibly be re-called to life.—On the 20th however he was able to resume his journal, and to note that the brave and merry cook Pierre Schubert was dead, the second victim of that awful rescue journey. He trolled gay songs from Beranger to the last. On that day Dr. Kane sent out Hayes and Godfrey to try their luck in a new direction. Hayes was the only educated officer left well. The rest were on their backs though some of the men were still strong and able to sleep in their walking suits at 62° below freezing point. On May 30th Dr. Kane reflects in his journal as follows.—"There must be many such men among Franklin's crew. I picture them parted into little broken-up detachments living by spearing the bear, trapping the fox, and killing seals and walrus and whale. I think of them even with hope. I sicken not to be able to reach them."

This is one of the most pathetic records I ever read. "He sickened not to be able to reach them." It was just sixteen days since he lay as they thought dying in his bunk from which he could not yet crawl. It seems to illustrate well a common observation, for if the words were almost ridiculous the spirit was altogether sublime.

Dr. Hayes came back June 1st, after a toilsome march, which I will not describe. Godfrey soon after starting had a shot at him not wishing to face such a march. Hayes took no notice of it then or in his report of their travel to Dr. Kane. The result was that no exit from the bay to the north had been found though the west coast had been traced some way.

So Dr. Kane organised another expedition. These were his materials :—

| | |
|---|---|
| Brooks | Unhealed Stump |
| Wilson | Ditto |
| Sontag | Down with Scurvy |
| Bonsell | Scurvy knee |
| Petersen | Scurvy |
| Goodfellow | Scurvy |
| Ohlsen | Well |
| McGary | Well |
| Morton | Nearly well |
| Hickey | Well |
| Whipple | Scurvy |
| Blake | Scurvy |
| Hans | Well |
| Riley | Sound |

Stephenson .....Scurvy
Godfrey.....Snow Blind

Morton, McGary, Bonsall, Hickey and Riley were sent off, Hans to follow. When Hans came up he and Morton were to go across the bay and push north. The rest were to scale the great glacier. They started June 4th. Dr. Kane went out seal hunting meanwhile. He sat watching a seal one side of a hole, and a bear the other. He fired, but the cap only exploded. Plunge went the seal and Dr. Kane took to his heels. On looking round he saw the bear equally frightened scuttling away in the opposite direction. On the 27th McGary came back quite blind. They had reached the great glacier and failed to scale it. While asleep in their tent a bear had come to the door, and walking up they saw him walking in, and he began to eat a seal they had on the floor. Tom Hickey, the Paddy of the crew, cut a way with his knife through the tent and running round got a gun and shot him. This glacier was sixty miles wide, so rugged and precipitous as to be quite impassable. Just as our hills throw off rivers, so Greenland hills throw off frozen rivers, and these frozen rivers are the glaciers which though their motion is imperceptible glide onwards into the sea, plough under it sometimes a quarter or half a mile, till the buoyancy of the water drifts them away. That is the way icebergs are formed not as you might think by dropping off cliffs into the sea, but rising up out of the sea.

On the 10th Morton and Hans came back.—They had had a wonderful trip and made a startling discovery. Leaving McGary Island June 18th, at 4.20, they were in the middle of Peabody Bay. They found themselves in the middle of bergs and hummocks unable to see their way ahead, but by dint of toiling on stubbornly they got abreast of the end of the Great Glacier at 7.20 next morning. On June 21st they stood to the north, but the ice became weak and rotten, and the dogs trembled and refused to advance. Hans had to go ahead and coax them on, when they would crawl on their bellies to him one by one. They reached the ice-foot, and pulling the sledge on end climbed up and hauled the dogs after them. After doubling Cape Andrew Jackson the ice-foot was good and they went six miles an hour. On the 24th they reached Cape Constitution. In vain they tried to double it. The ice-foot ceased. They could not scale it and climbing 500 feet up the rocks 2000 feet high, Morton to his extreme wonder saw in front of him to the north stretching far away to a dim iceless horizon, an open sea.—He stood on the most northern point of the then known globe. He unfurled a flag which I may call the most glorious flag in the whole world. It had been saved from the wreck of a United States sloop of war. It had sailed with Commodore Wilkes to the Antarctic Seas when he discovered a new continent. It now floated on Cape Constitution. It was subsequently

unfurled over the grave in which Dr. Kane's body was placed. And lastly Dr. Hayes unfurled it on a still higher point north, beyond which no living man has yet advanced. The birds in great flocks were flying northwards. A current set northwards. Vegetation was much more advanced than to the south. There was the moan of dashing waves. Dr. Hayes two years afterwards went some 100 miles higher, and the same sight was to be seen. He and Dr. Kane both were of opinion that they stood on the shores of an unknown sea, a sea round the Pole, which may contain another world, and a strange race of men.

By this time Dr. Kanes party had become fearfully desponding. The ice was quite fast round the Advance, and he dreaded the prospect of another winter. He thought he would try and reach Beechy Island, where he hoped some English ships were. I must omit his journey. It failed. I will show you the track of it on the map. Mc. Gary on this occasion stood steering the boat with an oar, in a storm, for 22 hours without aid.

They came back August 7th. On August 24th a council was called, and Dr. Kane said anyone might start for the south who liked, he should stick to the brig for he did'nt believe they could reach the south. Brooks, Morton, Mc. Gary, Ohlsen, Wilson, Goodfellow, Hickey, and Hans stayed with him. The rest under Dr. Hayes left the brig. Sadly Dr. Kane saw them slowly dropping out of sight. He then set vigorously to work with preparations for the winter, roofing in the brig with moss, collecting firewood and scurvy grass and hunting seals. Going out with Hans for seal, he and the sledge and dogs went through into the water. Toodlamick the leader, nearly drowned him by his piteous caresses, and when he had cut the traces and released the dogs he could not get out himself. He swam round and round the hole, but the ice gave way as fast as he tried to land. Hans stood on firm ice uttering a pious ejaculation every time he failed to effect a lodgement. When just sinking he managed to get safe by means of the sledge, and Hans, overjoyed, frictioned him with frightful zeal. Near the end of August another party of Esquimaux came. Dr. Kane gave them a good feast, and they repaid him by walking off with his lamp and Nannook, his best dog, and cutting his India Rubber Boat to pieces. Dr. Kane instantly sent off Morton and Riley, who marched to the nearest settlement, Anoatok, and brought back the wife of Metek and another woman as hostages, making them walk the whole thirty miles. This prompt justice overawed the Esquimaux and they made a treaty with Dr. Kane and promised to give him help in all his plans, a promise they fully redeemed and never stole anything again. Morton and Mc. Gary went to visit them and they gave them a hearty welcome, and, as at this time a tramp of 160 miles was thought nothing of, Dr. Kane set off walrus hunting in their company. He walked in a fearful storm 49 miles in 20 haltless hours

and slept with them in their hut, they lulling him to sleep with a song of Nalegak Soak Soak, which in his dreams blended with school memories of the "Frogs." These Esquimaux as a rule strip themselves naked in the coldest air, and hang up their clothes to dry, then creep in and sleep in a mass in their hut. Before entering it they will stand scratching themselves in the open air when the cold is 70° below freezing point. On another occasion Dr. Kane followed their example, for coming out of the cold some 60 below freezing point into an atmosphere 120 above freezing-point, into a hut measuring fifteen feet long by six wide, with fourteen fat Esquimaux round a number of lamps, he could not keep his clothes on. So he stuck the baby under his arm for a cushion, and to use his own words, "pillowed his head on Myouk's somewhat warm stomach," and so slept out the night. These Esquimaux have a custom of crying every now and then without apparent reason. On this occasion the chief matron Mrs. Eiderduck suddenly began to weep. It is etiquette always to join them. So Dr. Kane instantly took out his pocket handkerchief, and first shedding a decent tear himself, politely wiped her eyes. She rewarded his presence of mind by a great compliment: she took a morsel she was masticating and presented it to him, and he composedly finished its deglutition. Surely this may be considered the crowning act of heroism in the whole expedition.

They hunt walrus in this fashion. A walrus appears at a hole in the ice. They get cautiously near and harpoon him, running away with the line and planting it by means of a spike in the ice. The walrus furiously plunges about the hole for a time and then dives. Immediately the hunter runs away with the line and plants it elsewhere, and scarcely has he done so when up comes the walrus through the ice just where the first plant was made. And so the game goes on till exhaustion puts an end to it.

They were now troubled by bears and rats. One bear came right up to the brig and walked off with a barrel of herrings. She and her cub were shot and eaten. Esquimaux dogs are trained to hunt bears in this way. One dog nips him behind and as she turns and pursues, another gives a nip the other side. If he catches one he grips it with his teeth, and hurls it to a distance and the dog falls quite limp and unresisting, so that he is not hurt and ready to take his place again in the fight. The bear when her cub is wounded will put it between her fore legs and almost talk to it, to urge it to run faster. When the old one is killed the little ones mount her body, and, standing on their hind legs, do battle for the mother's corpse.

As for the rats, Dr. Kane could not put a hand into his mitten without finding a nest and being bitten to the bone, and as he snatched away his hand the combined family would run off with the glove. He sent down one of the sluts, Rhina, into the hold. But instead of her killing the rats, they

immediately began very coolly to gnaw off her nails and the horny skin of her paws, so that she was drawn up howling and beaten. Dr. Kane caught a fox and trained it to rat-catching, and he himself took to eating the rats. His companions were more squeamish in taste, so he had all the more fresh meat. Perhaps it was this support which helped him in a trip with the Esquimaux to support Myouk after they had walked for thirty miles at a stretch. Dr. Kane made it a point never to shew fatigue to the Esquimaux, so he cheerfully lugged on the big fellow who could have carried four of his size.

As the winter darkness set in and their fuel grew less, the poor forlorn little crew grew homesick and dismal. Mc. Gary paced the deck all Sunday, November 12th, without eating a meal. The only three not ill were Riley, Morton, Ohlsen. On December 2nd Mc. Gary was down and expected to die. Brooks was dangerously ill. Dr. Kane meted out to them 2 of 12 remaining potatoes raw, more precious to them at that time than two diamonds of equal size. This awful disease, scurvy (which softens all the limbs, contracts the muscles till they decay away, covers the body with running sores, eats away the gums, and fills the sufferer with the most frightful feeling of despair) is caused by want of fresh meat and vegetables. Dr. Kane was sorely stricken with it, but his stiff limbs relaxed fast enough one day when going bear-hunting, he was suddenly charged by what he thought was a lump of ice, and he only saved himself by throwing away first one mitten then another to the pursuing bear. Soon after this adventure the moss of the brig took fire. Dr. Kane fell down the hatchway in putting it out, and had his beard, eyebrows, and fore-lock burnt off.

On the 7th of December, he was awoke by the cry of "Esquimaux alongside." They were bringing Bonsall and Peterson with news that the others of the seceding party had broken down 200 miles off and were starving. On the 12th the rest were brought in, the thermometer being at 82° below freezing point, and Dr. Kane, though he could ill afford such an addition of sick men to eat up his small stores, welcomed them like brothers. It was a proud moment for him. They had despised his advice and deserted the ship, and now they were dependent on his bounty again. Not that he had any other feeling than of sad pity for their sufferings. Dr. Hayes lost the toes of one foot and all of the party were more or less injured.

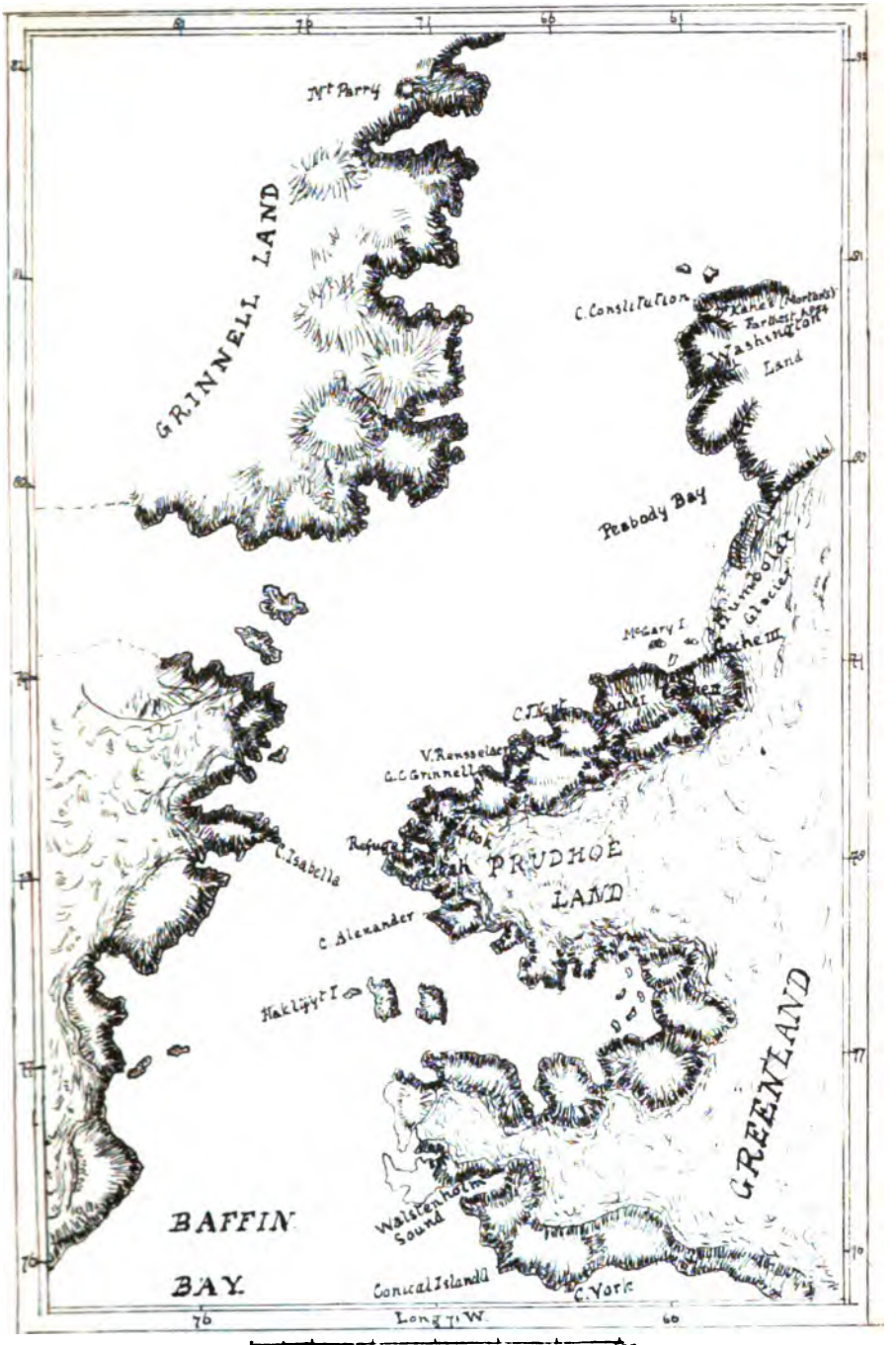
On December 25th, they drank the health of friends at home with ferocious zest over one-eighteenth part of a bottle of champagne—the last of their hamper, and amused themselves by passing round in imagination, turkey, roast beef, and above all in their scurvy-sickened longings, potatoes, melons, and cucumbers. Mc. Gary kept them laughing by his stories.

On December 28th, Dr. Kane set out to go out to the Esquimaux for fresh meat. He and Petersen were caught in a furious gale and had to encamp.

Petersen woke him with the horrible words "Captain Kane the light's out." To their great joy they struck a light, but they were obliged to go back unsuccessful to the brig. The dogs were now quite subdued, one of them licked Dr. Kane's hand—a thing an Esquimaux dog never does. He was at his wits' end how to feed them, till one morning Old Yellow, as Dr. Kane was feeding Jenny and her puppies, suddenly snapped up one of them and gobbled it down before the Doctor could turn round. He took the hint and refreshed old Yellow with a puppy for his breakfast till they were gone.

Dr. Kane made a second attempt to reach the Esquimaux and failed, and sent off Peterson and Hans who also failed. They were now in a fearful condition. Their meat was gone; they had only five well men on the ship, the rest were disabled. Dr. Kane was the working man of the crew. At last only he and Bonsall were left. He brewed strange drinks for them; he tried to make the sick eat strange food. These were his day's duties—to chop 1½ sacks of ice for water, to cut three fathoms of frozen rope for fire, to hack some molasses, to hew out pork and dried apples with crowbar and pickaxe, to perform all the nauseous duties of nurse to the sick, cook, keep watch, and note the the thermometer. The old scurvy-wounds opened afresh, and Mc. Gary, Brooks, and Wilson were in a bad way. Brooks catching sight of himself in a looking glass burst into tears. This was the sort of talk Dr. Kane listened to from the banks.

Brooks says "Well Mr. Ohlsen, I thought we never should have got through them hummocks. I fell down and don't remember no more till Petersen crawled into the tent. I think I must have strained something and gone off like into a kind of fit." (He was talking of that famous rescue expedition.) Ohlsen answers, "Yes! my boots pinched me then," and Brooks says "Yes, and Baker's boot pinched him too, but it wasn't the boots but the killing cold outside the boots. There was Pierre, his boots were moccassins with deer skin foot rags, but he died for all that, and there's Mr. Wilson and me now laying on neither one way nor tother, its a question which of us lasts longest." Then McGary gets up and checks Brooks for being so downhearted. Brooks growls at him and goes on. "Captain Kane five nights to come one year you came on four of us flat as a flounder. I didn't look at your boots, but I know you wore Esquimaux ones. It was a hard walk for you, the greatest thing ever I heard tell of, but"—here he began to soliloquise—"Baker's dead, and Pierre's dead, and Wilson and I"—Then Dr. Kane broke in "Shut up Brooks, you'll hurt the others;" but no! the old times were strong on him, and catching hold of Dr. Kane's arm he said in low, bass, quiet tones, "Doctor you cried when you saw us, and didn't pull up till we jabbed the stopper down the whiske" tin and gave you a tot of it.


Mt Parry
GRINNELL LAND
C. Constitution
Washington Land
Peabody Bay
McCary I
V. Rensselaer
C.C. Grinnell
Refuge
PRUDHOE LAND
C. Isabella
C. Alexander
Hakluyt I
BAFFIN BAY
Walstenholme Sound
Conical Islands
C. York
GREENLAND
76
Long. W.
60
20 10 0 10 20 30 40 50 60
Scale. Nautical Miles.

On February 23rd, Hans shot a deer. All who could stand went to pull it in, but were so weak that it took them a very long time. But it saved the lives of some of them.

On March 9th, Hans again brought them some walrus. Dr. Kane had sent him to the Esquimaux and he found them also starving. They had eaten all but four dogs. But he went out with them and killed a walrus and brought part home.

One of them was called Awahtok, 22 years old, his wife 18, both pleasant and good natured looking, with a fine little girl. Hans casually told Dr. Kane that Awahtok had just buried this child alive under a heap of stones,—Dr. Kane sent off Hans a second time to hunt with the Esquimaux, for either he must get food or his men must die.

Two of them, Godfrey and Blake, were strong and well, and these two were as I have said, the bad ones of the party. They tried to desert but Dr. Kane hid himself and pounced out on the big Godfrey as he was slipping off, and taking him below flogged him, after reading out a long list of his offences.—Godfrey vowed reformation and was set free, but in half an hour after deserted.

Dr. Kane was terribly alarmed for Hans, for he felt sure Godfrey would rob and perhaps murder him, and as Hans did not return grew more alarmed. Amid all this misery and drudgery on March 25th he records that his brains got working on Bunyan's Delectable Mountains, which his fancy identified with the mountains to the north. "Once on your coasts O inaccessible mountains I would reach the Northern Ocean and gather together the remnants of poor Franklin's company. These would be to me like orchards, and vineyards, and running fountains, and we would look down on a Polar Sea refulgent with sunshine." Still, you see, he was thinking of Franklin, of Franklin always, through all his sorrows. Then as his spirits sank again he bethought himself how that at the foot of the Delectable Mountains lay dashed to pieces many whose bones lie unburied to this day.

On April Hans was reported coming back.

It turned out to be not Hans but Godfrey with a sledge of walrus meat. Dr. Kane went with a pistol and summoned him to surrender. He would only come to the gangway and while Dr. Kane went for irons was left under Mr. Bonsall's charge. He turned to run just as the Doctor came on deck. Mr. Bonsall's pistol missed fire. Dr. Kane snatched up a rifle but it missed fire. A third piece went off but it was a long shot and the man escaped. They found afterwards Godfrey had brought the meat hoping to make a bargain with Dr. Kane for his liberty with it. On April 10th Dr. Kane went on a sledge and to his great joy found Hans coming back.

Hans had been ill at Etah, and the Esquimaux had nursed him kindly. Godfrey was there playing the great man. So on the 18th Dr. Kane set out

disguised as an Esquimaux for that place, met Godfrey as he drove in, clapped a pistol to his head, handcuffed him and brought him back in triumph to the brig.

I must hasten on now to the end. Two more attempts Dr. Kane made to explore the North coast, but both failed. It became plain too that the ice would not relax its grip of the Advance that summer, so that they must either winter again or escape over the ice. To winter again simply meant to die.—So they prepared for the other alternative. 1300 miles lay between them and their destination. The four sick and helpless men—luckless members of Dr. Hayes' seceding party were removed to Anoatok. These last were mounted on sledges. The man were all equipped with ruc-raddies or harness belts. On the last Sunday Dr. Kane read prayers, and then all standing silently round, took down Sir John Franklin's picture and wrapped it in India Rubber. He then explained the necessity of the step he was taking, and everyone signed an address thanking him and approving of what he did. There was no mockery of cheers. They set out firmly but sadly with their two boats of well-omened names, The Faith and The Hope. They hauled all day and returned and slept in the brig at night till they had got so far that the walk home became too much Dr. Kane on a sledge went again and again to it to bake bread for the others till they had got 60 or 70 miles away.

His last visit was with Metek. He and all the Esquimaux were gorging now on myriads of birds which they eat raw, and bear's meat. They often have narrow escapes from bears, running for their lives and getting nipped in the calves of the leg by them. Metek was suffering from a bite somewhat higher up. Awahtok and Myouk had had during the winter a fearful adventure. They had killed a walrus and with the carcase drifted away on the ice. There without any shelter, they remained with the cold 70° below freezing point a whole month, in the dark, the sea washing over them sometimes. But they drifted to the coast at last and were received by their friends as if they had come from the tomb.

These Esquimaux gave Dr. Kane most generous help. He did not tell them he was going away for good but only on a hunting party, for he had never felt quite sure how far their friendship was owing to fear. But now they proved themselves disinterestedly friendly and when he finally parted from them at Littleton Island, Dr. Kane felt real pity and regret. Presents were given them all round, Metek getting the big surgical knife, Mrs. Eiderduck plenty of needles, and Dr. Kane pow-wowing the little pot bellied child of Metek. They had hard work to reach the sea and but for the Esquimaux could never have succeeded. One of the sledges with all the documents went through the ice to the bitter grief of all, but to their great joy it was fished up again. A second time a sledge was saved by Ohlsen who by

a great exertion of strength held it up as it fell through. But it cost him his life. Dr. Kane concealed his death from the Esquimaux and sending them off to hunt birds buried him under a cape which bears his name, laying on his manly breast a tablet of lead with his name and age on it. Then he says he thought sorrowfully how like his own story was to that of Barendz two hundred and fifty seven years before. Crews of the same number. Deaths of the same number. And then the thought how last of all Barendz perished himself, and his spirit seems to have sunk for the first time. The story of their wonderful home journey is full of excitement but I must omit it. Sometimes they hoisted sails on the sledges and sailed on the ice with a fair wind. Sometimes they hauled all day through hummocks with a mile or two's progress. They launched on the water once more at Cape Alexander. One of their party had deserted than. It was Hans. When ill at Etah he had been tenderly nursed by a young Esquimaux lady and he and she had been seen lately driving south together in a sledge. "Good luck go with him" says Dr. Kane "for he was a right good fellow." Hans' old Fiskernaes sweetheart probably would not have endorsed that verdict. To their great horror the helmsman once missed his way and they went miles out of their course into a cul de sac of icebergs, and had wearily to go back the whole journey again. Their strength gave way. The found they could not stir their boats one day and thought the ice must be holding them, not knowing it was their own strength gone. Before they got to Cape Shackleton their food failed them. They were actually starving when they saw a seal floating on a small patch of ice. They muffled the oars in stockings and breathlessly drew near. Petersen was ordered to fire but trembled so that he could scarcely do it. Just as the seal raised his head preparing to plunge Dr. Kane nervously gave the signal. Crash went the rifle and with a wolfish howl the whole crew rushed to the spot and found the seal dead. They all sat down and began at once on the raw blubber sucking their bloody fingers with ecstasy. Dr. Kane says he had then hardly realised what a dreadful condition they had been in. At the beginning of August they were off the Devil's Thumb. Petersen woke up Dr. Kane to tell him a story. He had seen a native in a kayack and recognized him, "Paul Zacharias don't you know me, I'm Karl Petersen." "No" the other answered," his wife says he is dead," and paddled away in a fright. Two days after they heard through a fog the sound of oars. "Listen, Petersen, what is it," Dr. Kane said in a whisper. How the men bent to their oars! Soon a vessel was in sight. And Petersen burst into a fit of hysterical crying. "'Tis the Upernavik oil boat. Tis Fraulein Flaischer and Carlie Mossyn on his voyage for blubber." Sure enough it was Carlie Mossyn. They asked what was the news. "Sebastopol not taken." Sebastopol? What was Sebastopol? Where was Sebastopol? But what of Sir John Franklin? And

they told them his relics had been found 1000 miles to the south of where they had searched. And so they out oars and rowed again into the fog. Very soon Saunderson's Hope was in sight. They heard the bay of dogs. They heard a bell which Petersen knew the sound of. Could it be a dream! They hugged the land round the cape. They were on the shore. The music of a hymn of welcome was sounding in their ears. For the last time they hauled their boats upon the rocks. For eighty-four days they had lived in the open air. Their habits were hard, and weather-worn. They could not stay in a house without feeling suffocated. But that night they drank coffee before many a hospitable hearth. They left Upernavick on the 6th, and on the 11th reached Godhaven. An American vessel stood in. Dr. Kane rowed out to meet it. The officer, Captain Heartstene, who had been sent to search for him was on deck, and hailed the little man in a ragged flannel shirt. Are you Dr. Kane? Yes.

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There were 59 persons present: 3 Hon members, 16 members and 50 visitors.

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## APRIL 9TH, 1869.

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A Conversazione was held in the Adderley Library to commemorate the 5th anniversary of the Foundation of the Society.

Selections from the different collections in the Society's Museum, as well as specimens of all the Plants in flower in the neighbourhood were arranged round the sides of the Library. C. M. Bull, Esq., lent a valuable collection of Coins, and R. W. Taylor, Esq., a large collection of Photographs.

J. Walker, Esq., M.D., sent down 4 fine Binoculars from Ross, with every requisite for showing them.

About 40 visitors from Marlborough were present, and 100 members of the School, together with the majority of the Masters.

Before entering the Library a Lecture on Carbon, illustrated by experiments, was given by Dr. Fergus in the Museum, followed by some electrical experiments by F. Giles.

Refreshments were provided by the College, and after the departure of the company the members and their visitors sat down to a substantial supper in Hall, also provided by the College.

## MEETING HELD APRIL 16TH, 1869.

*Geology*—F. Giles exhibited a fossil bone from Battle, presented by F. H. Bowles; also specimens of Landscape marble from Clifton, Septaria from the Oxford Clay, an Echinus covered with Serpulæ from the chalk, &c.

*Ornithology*—J. B. Fuller passed round a list of notices, and exhibited a small box of Australian beetles.

*Zoology*—The President exhibited specimens of Spider Monkey, Vampire bat, and two fish, the White Bream and Tetrodon.

H. M. Hilton then read the following paper on

### "COLLECTING INSECTS."

I will apply myself this evening to telling you what little I can on the subject of capturing and preserving Lepidoptera, and the rearing of their larvæ.

A beginner in this noble pursuit is generally so full of eagerness to catch everything and go everywhere that he defeats his own purpose; this being the case, let us briefly go through the preparations for the most delightful of all things, a day's butterflying excursion in June or the beginning of July.

Now first and foremost, what instruments shall we require? of course, we must have a net to catch, and a box wherein to pin our captives. But of nets 'there are many kinds,' the one most commonly used however is the *ring* net; this important instrument I would recommend all to make for themselves, for it is essentially necessary that the Entomologist should have a net particularly after his own liking, the weight of it being a great point of consideration. The size I should recommend for the bag, as being best adapted for common purposes, would be about two feet and a quarter long, and *not terminating in a point.*

Though the *ring* net is in general use, another kind of net is sometimes made use of by Entomologists viz: the *clap* net. Of this one reads more than one sees.

A *small ring* net always ought to be carried with us in case the day, contrary to our expectations, should turn out dull, for then it will be found of great service in easily capturing insects reposing on the bark of trees, palings, &c. This can be easily made of a piece of strong wire twisted and covered with green gauze after the manner of a common ring net. It should not be more than a quarter of a foot long from the top of the net to the end of the (wire) handle so that it can easily go into the pocket.

I have found the long net which is used for Purple Emperors useful in catching specimens of *G. Rubricollis* off the low oaks, and sometimes Hair-

streaks, but it is a very unwieldy instrument. Except off the low oaks they could be easily reached with a simple net. I have found it the best plan for Hair-streaks, and *Rubricollis*, especially "Hair-streaks," to climb into a small oak tree that they are seen to frequent. Try to find five or six small oaks in a line, on the outskirts of a wood if possible, then mount one about the middle and get along the outside branches as far as they will bear you: in this way you will be able to reach the outside foliage of the tree which the Hair-streaks frequent.

The *best* time to catch them is about five o'clock in the evening. At this time they seem unusually lively and come out in great quantities. All insect life seems to get lively about that time. The catching of the Black Hair-streak (*T. Prunì*) is a far more serious matter, even if one by very good luck happens to live in a locality for them. They frequent the tops of blackthorn bushes from which they have to be beaten.

One other net there is which goes by the name of an *umbrella* net, as it shuts up and unfolds with the same celerity as an umbrella would. Mr. Coleman suggests that this was intended for the more timid part of the brotherhood who were afraid of the remarks of a *populace* on the carrying such an article as a butterfly net. But here was the difficulty; if it was a sunny day it was an absurdity to carry an (apparent) umbrella, if a wet day what an absurdity to keep a huge umbrella under one's arm for fear of its getting wet.

Equipped with a net, the article that next claims our attention is exceedingly simple, and does not entail the slightest expense. It is a *beating stick*. It is of course particularly needed on a dull day, for then insects, otherwise attracted out by the sun, are underneath the leaves of the trees from which it needs more than one smite, sometimes three or four, to dislodge them or send them flying out. Some fine specimens of rare insects are often to be obtained in this way. The collector, however, must in this pursuit have very sharp eyes, for the insects often fall straight from the boughs on which they were lodged and bury themselves in the long grass.

The next thing needed, having obtained the instruments "to catch the hare" is to obtain those we need "to cook it."

For this purpose a small collecting box is necessary such as we all know; besides this, should be carried by every collector, pill boxes innumerable. In these pill boxes are imprisoned those small *Geometræ* or other smaller insects that would become stiff were we to leave them till our arrival home. Instead of a common collecting box, a very nice one can be made by obtaining a large tin box, covering the bottom with cork, and leaving a space between some green gauze and the top in which to place bruised laurel leaves, so that we can keep our newly procured specimens from stiffening till our return home. This can be conveniently strapped over the back.

Besides the above, especially in spring, we should take (i) a larva tin or box; the former of which is preferable as it is cooler. In this should be placed some of the leaves on which the caterpillar is feeding. If possible two tins might be carried, as caterpillars of different genera have habits of preying on each other. (ii) Some pins—(iii) A note book for the double purpose of natural history notes and preserving small plants. (iv) A packet of provisions.

It is no good going out when a cold north wind is blowing; on such days we should hardly get many insects even by beating. If there is one thing an insect has an objection to more than another it is a north or north-east wind.

Coleman remarks that insects do not seem to be at all influenced by the picturesque or romantic in choosing their favourite haunts, and quotes the instances of the "large Copper" (*C. Dispar*) and the "Swallow-tail" (*P. Machaon*) as instances, both being found in the fens of Cambridgeshire and Huntingdonshire. I daresay this has been already observed by the least observant among us. How our gardens, the very places where we should expect butterflies to swarm, are only frequented here and there by a casual "white" or "brimstone."

It would indeed require the pen of one far other than myself to describe the delights of an entomological excursion, such as an entomologist only knows.

Does our whole pleasure consist in capturing insects, and placing them in our cabinets? There is certainly a great pleasure in this, but this is not all. It is the association of the sights and sounds of nature that makes it the enjoyable pursuit it is. An entomologist, remember, in his rambles sees some of the prettiest and finest sights of nature in the wood, in the glen, and on the mountain; and he has also ample opportunities for studying nature in all her various forms.

It is a good thing to use a note book pretty freely when on our entomoligical rambles, noting down to as great a degree as we are able the habits and localities of the insects, and those of you who try this will find that by the end of a season, not only have you collected a store of knowledge far more valuable to you than any that you could obtain from books, but also that you have compiled a little series of notes, really interesting to a casual reader. In such a way as this was "White's Selbourne" compiled. We cannot all hope to be Whites and we cannot all hope to live at a place so full of interest to the naturalist as Selbourne appears to have been, but we all can hope to get together by keeping up such a practice a very interesting series of notes.

The rest of the "cooking" is known to all before me either from personal experience, or from seeing other people perform the office, viz., the setting and drying of the specimens we have obtained. For this a contrivance termed a

setting-house, is very convenient, being a small square box, with a door to it, and grooves for the setting-boards to run in. This is a cheap contrivance and saves the specimens on the boards from much knocking about that they would be otherwise exposed to. I will speak of cabinets presently.

We have all this while been talking of supplying our cabinet by simple hunting for the specimens we needed, trusting to our legs; but science has placed other means within our power. "Purple Emperors," for example, may be captured by placing meat to decay near their haunts; besides this I will give two other instances. There is (i) a way that has become known to us of obtaining the males of some of the large *Bombycina*, especially of the "Oak Eggar" (*L. Quercus*) and "Kentish Glory" (*E. Versicolora*). It is this. If a female of either of these species be taken in a caterpillar cage or even in a box, to a wood in the evening the males of the species, if any are near, will flock to the female, and thus fall easy victims to the entomologist.

Number ii applies simply to the *Noctuæ* or night moths. It is what is familarily termed "sugaring," and consists, in spreading on the trunks of trees in the evening a glutinous compound of treacle, sugar, beer and rum. A large majority of the *Noctuæ* and even some few *Geometræ* flock to the sugared tree in great numbers if they are placed in favourable situations. Now both the situation of the tree sugared and the night chosen for the undertaking have a great deal to do with the amount of insects we obtain. The trees chosen should be, if possible, in the siding of a wood standing out a little from the undergrowth at the side. Sugar those that are surrounded by blossoms, for the moths coming to their old haunts to suck the nectar from the flowers are attracted thence to the sugar. As an instance, there was one tree in particular last summer in a wood near home, at which on one night I counted eighty moths; whereas at other trees only four or five might be seen and this I can only account for by the blossoms that surrounded the tree. The fact of their being on the outside of the wood seems to influence the productiveness of some trees to a great degree. As to the height one should sugar, that must be left entirely to the opinion of the sugarer for he must regulate the height by the surrounding undergrowth. The lantern when reflected to the tree should always be at a distance for nothing tends to frighten the insects off more than a sudden glare of light. The best method for taking the moths off the sugar is to put them in separate pill-boxes, for by this means a practised hand can take nearly every specimen in succession without frightening off the others. A net should be carried, as it may always be required:—As to the night, a warm cloudy night I have found by far the best, on a moonlit night we can hardly expect to get one.

We have now finished the ways and means of capturing the insects in the perfect state; there yet remains (i) Pupa-digging, and (ii.) larva-rearing. By

the former of these means I have heard competent people declare that they had obtained some of the very best insects they possess, but this means of obtaining insects requires one great quality—patience.

In the dry holes of elm and other large trees a great number of *Noctuæ* chrysalids may be found. Not all holes, mind, have these chrysalids in them, only those which are placed in such a way as to escape the wet in winter. I subjoin a tabular account of the chrysalids taken by myself last winter to show the most productive trees.

| | | |
|---|---|---|
| Elm 87 | ... ... ... ... | Sm. Tiliæ iii. Noctuæ xxxii. Geometræ ii |
| Oak 8 | ... ... ... ... | all Noctuæ |
| Chesnut 7 | ... ... ... ... | all Noctuæ |
| Beech, Lime | 3 ... ... | all Noctuæ |
| Apple, Willow, Ash | 1 ... | Noctua<br>Bombyx (under bark)<br>Sphinx Ligustri |

The most I have ever taken from one hole is 9. The trees which seem most productive are moderately large ones which have the ground raised round them; as they get into as dry ground as they can; and the species of tree, elm, in the holes in which dry earth has accumulated.

A small spade is the best instrument to use for digging, and you should dig close to the tree for noctuæ chrysalids, but should you have the good luck to hit on a hawk-moth chrysalis it will be some four or five inches away. The trees you should choose should be if possible in a row and of very large size. I have always found this kind of parklike ground on a hill, where there are many large trees in a row, by far the best. Chrysalids may also be found by looking under moss, and under the bark of willow trees.

These chrysalids, when obtained, can be kept in earth at the bottom of a common caterpillar cage, but the earth must be moistened occasionally, else the insects will be shrivelled up.

(ii) Larva Rearing.—I need not say much under this head. That Larvæ should be kept well supplied with food is essential to rearing them well. The best way for obtaining them is by placing an umbrella under a bush and beating violently; in this way many small larvæ which would otherwise escape detection are seen. These should, as before said, be carried home in a small tin for the purpose of keeping them cool.

So much for the catching and killing of lepidopterous insects. Now for the arranging. They may be arranged either in cabinets or boxes according to the wish of the owner. People have different opinions regarding collections. Some classify them, others have historical collections. A collection according to classification I need not describe, but an historical one is very interesting being (1) the larva, (2), the pupa, and (3) the imago of each species. The

great difficulty here consists in the stuffing of the larvæ which cannot be well done till after considerable practise; while the London Naturalists charge enormous prices.

The way however is to cut a little slit in the skin of the caterpillar near the tail, to press the inside out, and then, having placed the skin over a hot stove, to blow gently into it through a straw. The skin being inflated with hot air swells to its natural proportions, and if left a sufficient time over the stove dries in that shape.

Here I may make a remark which applies both to pupa digging and larva rearing. If, as I supect most of us do, we keep our chrysalids in a caterpillar cage, when they come out in all their new born glory ready to adorn the series in our cabinets, their is some difficulty in killing them without rubbing off the scales. First of all we should try to pin them, but if we think we cannot pin them straight, or that we shall damage them, I would recommend a net on this principle: get a short piece of stick; bore down it with an awl from the top; at about ½ inch from the top bore a hole in the side meeting the other; pass a piece of thin wire (doubled) through the side hole and out at the top, from which, when it is drawn out it forms a loop; on this stitch a small bag and it is complete.

It acts thus: place the mouth of the net over the insect in the cage; coax it to enter the net and then by simply drawing the wires the net is tightly closed and our friend is a prisoner.

With the collection should be kept a note book, in which should be inserted the date and locality of capture with remarks of every rare species we possess. A collection might be for the sake of appearance, like Indian moths arranged in glass cases, but exposure to the light would soon fade them and render them worthless or nearly so.

Thus have I gone over the rudiments of entomology, and I only hope I may induce others to study a science at once so beautiful and so interesting, which will not only reward them amply for their pains, but will also give them an insight far beyond what they expected into the beautiful walks of nature.

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H. C. Spry and H. R. Clarke were elected members, and H. Manders was re-admitted.

There were 61 persons present, 2 hon. members, 22 members, and 37 visitors.

## MEETING HELD APRIL 30TH, 1869

There were no exhibitions in order that there might be more time for the Lecture, which was given by J. Walker, Esq., M.D., on the Nervous System in Man. The Lecture was illustrated by numerous specimens, models, and diagrams. The following is an abstract of the Lecture.

## THE NERVOUS SYSTEM OF MAN.

I do not intend to go into the vexed questions that this subject may give rise to, but simply in as plain language as possible to describe the two great nervous centres of man, viz., the spinal cord and brain and the Sympathetic system, and how the entire frame and mechanism of our body is governed and controlled by its influences. To commence the task, I must set in motion, and that very freely too, the occupant of four walls. I mean the resident of my mouth in the shape of my tongue, and to do this I must call into great activity the grey matter of my brain, which is composed of *vesicles*, small bladders or cells. These vesicles stimulate the nerve *fibres* of motion, which pass from my brain to my tongue and give it the power of movement. The tongue, as you know, is composed entirely of muscle, several united together, and held in position by attachments to the floating bone in the throat called the *hyoid* bone.

We have in our body two kinds of muscle, voluntary and involuntary, of which the former is governed by the *Brain*, the latter by the *Sympathetic system*. The tongue is composed of voluntary muscle. We must *think* before we can speak, and when we have thought, the nerve fibres, running from the brain and thence to the tongue, will stimulate the muscle and set it in motion. This, then, brings into activity two kinds of nerve tissue and two kinds of nervous power are therefore exerted in the movement of the tongue.

Occasionally, I presume, many of you are accustomed to use the boxing gloves. You must think before you can strike, and two nerves are thus called into action; but if successful in your striking and your fist should happen to come into contact with your opponent's head, your fist will soon feel the effect of the concussion, and that through *another* set of nerve fibres, which pass from the hand to the brain, and are called nerves of *sensation*. These fibres are quite separate and distinct from the fibres which carry the stimulus from the brain to the muscles.

Some few of you present have felt a large lump at your throat, a thumping at your side when you have first presented yourself before the Master for a *viva voce* examination. I can fancy I hear you saying "I *will* be brave, my heart shall be still and quiet, and that lump shall get smaller;" and in many

instances by a great effort, you can control in a measure the excitement you are suffering from. The heart is your great trouble: its increased action is due to the nerve fibres that are connected with the brain, and the excitement of the brain causes its increased action. But however much you desired to stop its action, positively you are powerless to stay its onward beat; and why? because the heart is composed of involuntary muscle, that is, muscle that receives its stimulant from the *sympathetic* system, which is contained in the body and lies *on* the spinal vertebræ.

This system governs the contents of the chest and abdomen, the heart, the lungs, liver, stomach and intestines, and the bladder. This nervous system never rests, but is always in action day and night; in sound and deep sleep the brain is regaining its lost substance, and the sympathetic system is therefore as necessary to us when in bed as when at our daily work. I shall presently show you how intimately the spinal cord is connected with the sympathetic and yet how entirely they are separated from each other.

Suppose I fold my arms and resolve to hold my breath; how long can I carry out that resolve? only for a few minutes. You can estimate its duration if you have ever tried to dive under water. The muscles of respiration are governed by nerves that spring from the spinal cord, they are voluntary muscles, but from the instant you commence holding your breath, an ever increasing desire compels you soon to relax your intention; why? Because breathing is necessary to life, and the lungs are, therefore, supplied with nerves from the sympathetic system, whilst the muscles of respiration, which are very numerous—all the muscles below the lower jaw and above the hip being called into action in respiration—together with those of the extremities, the arms, legs, and hands, receive the nerves of motion from the spinal cord. In a word, organic life is governed by the sympathetic, and animal life, by the brain and spinal cord.

To recapitulate—The brain is composed of two kinds of tissue, one cellular and of a grey colour, the other fibrous and white. With the former we *think*, and with the latter we *move*. Every motion of the body, whether it be a movement of the finger, a nod of the head, a step in walking, or rising from your chair (which will bring nearly all the muscles of your body into action) all require thought, and the stimulus will be carried from the brain by the nerve fibres of motion to all the muscles.

In this statement I can easily understand you to express some doubt. You may reply "suppose a schoolfellow gave my leg a prick with a pin, I should quickly move and that without thinking." This movement would be due to simple *Reflex Action*, as the point of the pin, to produce pain, must come in contact with a nerve of sensation. The fibres of this nerve would carry the sensation to a nerve *ganglion*, or nerve centre. The sensation will im-

mediately pass from the nerve centre in two ways, one upwards to another nerve centre and so on to the brain, the other at the same moment through a motor nerve to the muscles of the part pricked, and so produce the movement of the leg.

To illustrate this more fully, we may see the various modes in which a nerve may act in the case of the eyelids: 1st there is the *simple reflex action*. If when the eyes are open, a fly touches the lashes, immediate blinking takes place. Here the impression of contact is conveyed through the sensory fibres to the ganglion at the base of the brain, and a motor impulse is directly propagated to the muscles of the eyelid and so produces blinking. 2nd Blinking occurs though a person may be in a state of half sleep or somnambulism, or rendered partially insensible by chloroform; this would be due to *sensory motor action*, the stimulant and the propagation both coming from the brain. 3rd Blinking and winking are often seen in Hysteria, when persons are fainting; this is due to *emotional reflex action*, and 4th, we can wink and blink *at will*, that is, if we propose doing so, we must think before acting.

Before entering into any particulars of either of the two systems of nerves, allow me to say that all nervous substance is vesicular or fibrous. The vesicular is made up of cells, which may be spheroidal, fusiform, corodate, stellate, or almost any variety of shape; the fibrous consists entirely of nerve fibres, the most perfectly developed form being tubular. A nerve centre may be small or large, but must be composed of vesicular and a complemental part fibrous tissue: the vesicular to originate changes, which it is the function of the fibrous to conduct. In reading various authors on Physiology, please remember that one difficulty you will have to encounter is the different names that various authors give to the same substance; but by whatever names nerve centres are denominated, the *structure* can never be altered. Cells are the basis of large nerve ganglia and fibres are the connecting media from one ganglion to another, and to all structures of the body. When speaking of a nerve, say, for instance, in the hand, the nerve spoken of may comprise many fibres enclosed in a smooth transparent membrane, and several of these "funiculi" are again bound together in areolar tissue and enclosed in a sheath of yellow elastic fibres. In the same sheath are found fibres which convey sensation to to the brain (called the afferent or centripetal nerve) and those which convey the impression of the brain to the surface of the body, (called the efferent or centrifugal nerve). You may compare an afferent or an efferent nerve to a submarine cable, the centre of the cable would be the axis cylinder of the nerve, the non-conducting gutta percha coating the fatty matter of the nerve, and the external coating of hemp the *neurilemma* or exterior covering of the nerve.

I will now show you the position of these nerve centres. First, then, as you are all well aware, the bones of the skull enclose the brain, and as soon as the brain passes out of the *foramen magnum* (the hole in the skull above the backbone) it becomes the spinal cord. The spinal cord and brain are only different parts of the same system and are continuous, the division only being arbitrary. The brain is, in fact, the outgrowth or an expansion of the spinal cord. To the divisions and subdivisions of the branches of these large nerve centres I shall be only able to give a passing thought. You can see how each part of the human frame is supplied with nervous power by casting your eye over the diagrams in which the nerves are shown by white lines.

The brain and spinal cord are covered with three membranes, the *Dura Mater*, *Arachnoid*, and *Pia Mater*. The dura mater is a strong fibro-serous brane covering the inner surface of the bones, and acts as the *periosteum* (or membranous covering) of these bones. It folds upon itself in various parts and forms canals for venous blood, the passages for the return of the blood from the brain. It also passes between the two hemispheres of the brain, that portion being called the *Falx cerebri*. Another portion, called *Falx cerebelli*, similarly divides the *cerebellum* or smaller brain. These portions prevent oscillation of the brain from side to side. A third portion is stretched from side to side of the skull and attached firmly to the bone supporting the cerebrum and acts as a tent to the cerebellum.

*The Arachnoid* membrane is a thin glossy membrane very much like gold beater's skin. It is double, bends back upon itself, and thus becomes a shut "Sac."

Between the two layers a space exists, which contains fluid, this fluid prevents concussion of the brain, and also the Dura Mater and Pia Mater from rubbing together and thus by friction injuring each other.

The Pia Mater is a highly vascular membrane, the nourishing membrane of the brain. It derives its blood from the internal carotid and vertebral arteries. The branches of these large arteries form a circle, called the Circle of Willis, at the base of the brain. The brain is the largest nerve centre in the body, it is composed of the *cerebrum*, *cerebellum* and *Pons Varolii*. The size of the brain appears to bear a general relation to the intellectual capacity of the individual. The brain of many of our clever men has weighed 63 and 64 ozs., whilst the brain of an idiot will only weigh 23 ozs. The brain of men of average intelligence will weigh 48 ozs. and of women 5 or 6 ozs. less. Male minimum 34 ozs.; Maximum 65 ozs. Female minimum 31 ozs.; Maximim 56 ozs. Two substances only as yet have been ascertained to enter into the substance of the brain and spinal cord. The Grey or vesicular, as I have told you, is formed of cells of all shapes. The White or medullary of fibres passing some transversely, others ascending and others again descending and interlacing with each other.

The cerebrum is the largest division of the brain, it occupies the entire length of the skull and is separated from the cerebellum by the tent of Dura Mater. It is divided nearly through its entire substance by a longitudinal fissure separating it into two hemispheres which are united by the *Corpus Callosum*, the great transverse *commissure* (or band of union) of the brain. The upper surface is convex, of an ovoid form, and presents a number of convoluted eminences separated by depressions called *sulci*. The depth of these sulci varies very much in every brain and also in the same brain: the higher the eminences and the deeper the sulci the greater will be the external surface and the larger the surface of grey matter.

I told you the size of the brain determined the mental calibre, but we must modify that general statement by noting the fact that the brain must be in proper proportion, the cerebrum bearing a relative size to the cerebellum—again if the brain is large but the eminences slight and the depressions shallow, the fibrous portion will be in excess and the purely intellectual less, therefore it is not always the size of the brain that will determine whether a man shall be a scholar or a fool, but rather how each part is developed; the brain can be brought to a high state of development by exercising it equally, as muscle can by training and use. The number and extent of the convolutions, increase and become more complex as we ascend from the lowest class of Mammalia up to Man. In children the convolutions are few, and the depressions very slight, but as the child increases in mental power the surface of the brain becomes more irregular; and assumes its deepest sulci when the child arrives at the prime of life. But as the full grown man descends the ladder of life the outer surface of the cerebrum attains somewhat the appearance of early life, the convolutions become much less marked, the eminences flattened, and the sulci less deep.

The under surface of the cerebrum is more uneven than the superior. Both hemispheres are divided into 3 lobes, anterior, middle, and posterior; the lobes are divided by fissures, each bearing a name, but as the nomenclature of the brain will little serve my purpose this evening I shall omit as much of it as possible.

The cerebellum or little brain is situated in the Inferior Occipital Fossa between the two Posterior lobes of the cerebrum. It is about five or six ounces in weight. The proportion between the cerebrum and cerebellum is 1 to 8¼, the cerebellum attaining the larger size in the female than the male. In form the cerebellum is oblong and flattened from above downwards; it measures transversely from three to four inches, two to two and half from before backwards, and two inches thick in the centre.

The surface is not convoluted like the cerebrum but transversed by numerous curved furrows. It is divided into two hemispheres united by the *Vermiform* process. Each hemisphere is again divided into an upper and lower

portion by the great horizontal Fissure. From this primary fissure other small fissures spring which divide the little brain into lobes, seven in number. Two above and five in the under surface. The grey matter is darker than that of the cerebrum and is situated on the outer surface.

The Spinal cord very much resembles the brain proper. It is enclosed in bone walls, the vertebrae, and is covered by three membranes and held in position by a ligament made of an expansion of the Dura Mater. The spinal marrow is firmer and more pliable in texture than the brain, and thus easily adapts itself to the curves of the spinal cord. It extends from the base of the brain to the pelvic bones. The cord is nearly divided in the centre by an anterior and posterior fissure the two halves united by a commissure of white matter. Each half is divided into three columns anterior posterior and lateral. The Grey matter is enclosed *within* the white and assumes a peculiar shape. Each nerve arises by two roots, one root from the anterior column, the other from the posterior, the posterior as soon as it leaves the foramen of the vertebrae forms a ganglion with the sympathetic. The fibres of the anterior *pass* the ganglion and then unite with the posterior. These nerves thus produced unite and form Plexuses or networks.

Mr. Brown Sequard has given 20 years study to the fibres of the spinal cord and brain and he has now demonstrated to the satisfaction of many that the nerve fibres of *motion* pass upward on the side of the spinal cord from which they spring to the under surface of the Medulla Oblongata and then all the fibres cross over to the other side in a bundle, but that the nerve fibres of *sensation* pass over to the other side direct: the same arrangement of nerve fibres exists on both sides of the spinal cord and you must please to remember that in describing the arrangement and distribution of one side the opposite side is always in harmony. Mr. Brown Sequard states that if you could divide the spinal cord downwards from the fifth cervical vertebra in the median line you would only affect the sensory nerve of man and not his motor power, that is he would have the ability to walk but that you may cut and slash him about and he would experience no sensation.

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There were 77 persons present. 3 Hon. Members, 26 Members, and 48 Visitors.

## MEETING HELD MAY 14TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors :—

Model of a canoe and ornament from the head of a canoe from the Feejee Islands, and a couple of grass cloaks from New Zealand, by W. S. Bambridge, Esq.

A collection of minerals and ores from the Botallac mine in Cornwall by W. H. Borlase.

Specimen of Stigmaria from the Forest of Dean by Mrs. Jones, Marlborough.

Fossils from the Lias near Cardiff, by G. E. Manisty.

Specimen of Malachite, by H. J. Verrall.

A long list of Ornithological and Entomological notices was passed round, the most important being the capture of *P. argiŏlus*, by B. J. Fuller.

Collections of coins by M. H. Smith, E. A. Furneaux, and the Rev. C. Soames.

EXHIBITIONS :—A box of moths captured this year by H. M. Hilton.

Specimen of silk-cotton, by H. J. Verrall.

G. C. Mansell was elected a member of the Society.

The following paper was read by W. D. Fenning, on

## THE ANTIQUITIES OF MARLBOROUGH.

I AM aware that I may be accused of plagiarism in treating of this subject. I must therefore at once confess my obligations both to Dr. Cotton's lecture and to two papers read here by Dumergue. But Dr. Cotton's lecture was delivered more than fourteen years ago and is now out of print; therefore I suppose but few of you are acquainted with it. Besides I intend to take a more extended and more general view than either of my predecessors.

Of course I shall begin with the college. Neither "A" nor "B" houses, nor in fact any of the buildings except the Old House can lay claim to antiquity in the smallest degree. I shall therefore speak only of the Old House, which was built by Inigo Jones the architect of Whitehall, Wilton House, Ramsbury Manor, and many other fine buildings. My readers probably know as well as I do the various legends connected with it, the C. House Ghost, and the mysterious underground passages which are said to have their exit in the forest, but which I believe have never been discovered. The finest room in the Old House is the library, originally two rooms, but thrown into one to form the first dining hall of the New College, and since transformed into a Library. One of the most noticeable points in the building is the elevation of the rooms. Though not so well suited for many reasons to its present use as the new houses, it is the only portion of the college buildings except perhaps the chapel, that has any pretensions to architectural beauty.

We now come to the mound. It was probably raised by the Britons as a tomb, and was intended to match Silbury Hill, as they are both situated on the Kennet and were evidently once of nearly the same size. It afterwards supported the keep of Marlborough Castle, was then laid out in terraces, and adorned with grottoes, some of which still remain. It is now used as the College reservoir for which its height admirably adapts it. The bathing place is probably part of the old moat. Marlborough boasts a High Street, broader, I believe, than can be found in any other provincial town in England. Every visitor is astonished at its breadth. Taken all together it is also a picturesque street: true, the barbarous restoration of the Town Hall is a great misfortune, as all who remember the old building must admit; but municipal bodies were never famous for good taste. There are still, however, many very nice old houses; there is for instance the one occupied by the late Mrs. Emberlin and Mrs. Bane, which but that the latter has put large panes of glass into the windows is a splendid specimen: the interior too corresponds, and the staircase is very fine. There is a nice looking house again in the street leading from Kingsbury Street to the Green, though I dare say but few of you know it: Mr. Avery's too, and many others are decidedly better than the common run. The penthouse again is unusual; by the penthouse I mean the verandah that stretches from just above the Royal Oak to the end of the High Street.

Leaving the town we will first take all the Roman remains in the neighbourhood. The first of these is the small camp on the common at the corner nearest the town which is used as a cricket ground by the youths of the town of Marlborough: its shape is oblong, and here I may as well remark that all true Roman camps are either oblong or square, and have but a single vallum, whilst British and Saxon works are of irregular shape, generally following the outline of the hill on which they are situated; a double or triple rampart is a proof that Saxons have either built or at any rate made use of the camp. All that we know of the one in question is that it was probably an appendage to the Roman Station Cunetio: about the exact site of the latter there has been much dispute, some placing it at Mildenhall, others at Folly Farm on the left hand of the Hungerford road, just before it enters the Forest: Sir Richard Hoare believes that these were two stations, which he calls Upper and Lower Cunetio. Several Roman roads met at one or other of these two stations: one ran very much in the line of the present Bath road, but it cannot be distinguished on this side of Beckhampton: there is another however which may easily be perceived by any one who is sufficiently energetic to look for it. Follow the road that passes Rabley copse till you come to a sign post standing by itself on the downs. Here take the turning to the left which is actually the track of the old road. After following this for about a mile you will come to the top of a hill, over-

looking the two Ogbournes. From this point the course of the Roman road may be very clearly seen, running almost in a direct line through the further Ogbourne to Chiseldon. The Romans always made their roads as straight as possible and often carried them over steep hills, when a very slight detour would have enabled them to keep to the valleys. In the present case, however, the road does not meet with any very steep hill, and for this reason the old track was used when the New Swindon road was formed. This, I believe, concludes the list of Roman remains in the neighbourhood. We will now turn to those of British and Saxon origin.

One of the most interesting places within easy walking distance of Marlborough is certainly Martinsell Hill, or as it is more commonly called Martin's Hill, not only for the British remains to be found there, but also for the beautiful and extensive view to be obtained from its summit. The prospect extends over what is generally known as the Pewsey Vale, which divides the Marlborough downs from Salisbury Plain. A long narrow spur runs out on the South west side of the hill, and in the hollow between this and Oare Hill is Rainscombe park, which is very prettily situated with the wooded slopes of the hill on three sides of it. On this narrow spur formerly stood a summer house which was blown down some years ago, but the place is still called Summer-house hill. From this point may be seen Wilcot Hill and Woodborough Hill both remarkable for their curious conical shape, and St. Ann's Hill or Tan Hill where a large cattle fair is held in August. Before leaving this part of the subject I may mention that Martinsell Hill is the highest chalk hill but one in England. Inkpen Beacon near Hungerford is the highest.

To consider the hill now archæologically. As you reach the top from Clench Common, you will see on your left and a little below you a number of mounds and hollows evidently not formed by the hand of Nature. These are generally considered to be the remains of a British Village. The dwellings of the early Britons were merely holes in the earth, thatched over with boughs and brushwood. We have no evidence of brick or stone being employed, so we need not look for any remains of walls or foundations.

It is also possible to trace a sort of street running through these pits and there is a curious winding road leading down to the bottom of the hill.

Above the "village," and crowning the hill is a large fortification of an irregular oblong form. The rampart surrounding it is not so strong as we find in many similar fortresses, but the natural advantage of such a commanding position would fully compensate for this defect. These hill fortresses, were probably not used in time of peace, but when a tribe had to go out to war they would leave their women and cattle in these strongholds with a small garrison. Observe that this rampart is a single one which shows that it was raised by Britons.

The next British work which we will consider, excels even Martinsell in interest, I mean Avebury, or Abury as it was formerly called. The shortest and pleasantest road to it is past the Devil's Den, through the valley of the Grey Wethers, and across the Downs to the left. This "Devil's Den" is a Kist-vaen, and probably the tomb of some British hero. It consists of one large stone, ten feet by eight, on the top of two smaller upright stones. The whole height is about ten feet. There were formerly two similar monuments in the same valley but they have been broken up by the farmers. Leaving this you come to the Grey Wethers or Sarsen stones interesting not only to the Geologist, but also to the archæologist, for of them are composed Stonehenge, Avebury and the Devil's Den. Certainly they strongly resemble a flock of rather large grey sheep browsing over the valley. Passing over the downs you come to Hackpen Hill, from which a general view is obtained of the village of Avebury encircled by the rampart, though it is hardly a rampart, properly so called, as it was not intended for purposes of defence, which is proved by the ditch being on the inside. I will now describe the plan of the temple as it originally stood. In form it was circular, surrounded by a very high bank of earth which was probably cut into terraces or seats for spectators. Immediately inside the bank, separated from it by the ditch, was a line of large upright stones a hundred in number. Within these were two smaller circles, side by side, now called the Northern and the Southern Temples. Each of these smaller circles was double, and had three large stones for a centre, called the "Cove:" the other had but a single one, which was, however, of enormous size, larger than any of those at Stonehenge. There were two avenues of stones leading to the temple. One started at Kennet, where there was a circle of smaller stones, and where probably the dwellings of the Druids were situated. The other extended to Beckhampton and terminated in three large stones. The two avenues together, being of winding form, have been considered symbolical of a serpent, having for his head the small circle at Kennet, and for his tail the three stones at Beckhampton.

The Beckhampton avenue is now almost entirely destroyed, and but few stones remain of the other. Of the temple itself there are so few traces remaining, that, had it not been for the researches of Dr. Stukeley two hundred years ago, we should still be in ignorance of the original design and plan of the work. Thus the unfortunate position of one wretched little village within the area of the temple has almost entirely destroyed this most magnificent evidence of the perseverance if not of the art of the ancient Britons.

With regard to the purpose for which it was raised, opinions are much divided; but it was probably a general gathering point either for some sort of Congress or Parliament, or for some great annual religious festival.

All who visit Avebury must notice Silbury. It is a large mound or small hill on the north side of the Bath road between Kennet and Beckhampton, and can be easily seen from Avebury. No one can fail to perceive at first sight that it is artificial. The diameter of the base is 552 feet, that of the top 104 feet, and the height 130. As I have mentioned before, it corresponds to our own Mound, which however is its inferior in size. Several extensive excavations have been made in it, but no traces have been discovered of the tomb which it most probably contains. There are several of these huge mounds scattered over every quarter of the globe, and most of them have been found to contain tombs which however do not always occupy the centre of the mound. There is a tradition that a man and horse, life size, and formed of solid gold are hidden in the interior of the hill. He will be a very lucky man who finds them.

We will now turn to the Wansdyke. This is a huge barrier stretching from the Severn to the Thames, and is more than eighty miles in length. The ditch is north of the rampart, so that the earthwork was made for the defence of people living to the south. It is constructed of two layers one added evidently long after the other, and this seems to point to the theory that it was originally constructed by the Belgæ, and afterwards strengthened by the Saxons. The name is most likely a corruption of Wodin's Dyke. It is easy to strike it from here. On the road to Martinsell there is as you all know a clump of firs just before you come to the railway. Through this clump the Wansdyke passes, but here the rampart has sunk considerably, and the ditch is very much choked up. The nearest point where it can really be seen to advantage is on Tan Hill where its appearance is very imposing.

Connected with the Wansdyke is the camp of Chisbury, near Bedwyn. It is of oval form surrounded partly by a double, partly by a triple rampart, and contains nearly fifteen acres. It is situated on a rising ground to the north east of Bedwyn. The road to it through the Forest is very pretty and well repays a walk. Chisbury has been proved by excavation to have been originally a British camp, but the double rampart shows that it was afterwards used by the Saxons. We are told that a great battle was fought here in 695 between two Saxon Kings. It derives its name from the Saxon Cissa, who took it from the Britons and made it his stronghold. Within its area is a small chapel, dedicated to St. Martin, now used as a barn. It is in the decorated style, and is mentioned at the beginning of the 14th century. The ramparts are in some parts thickly covered with trees and bushes, and the ditch between them is filled with water, which however was not intended to be there by the founders of the camp, moats being a Norman invention. While speaking of Chisbury I may as well mention Bedwyn, which is a small town, remarkable for nothing but a fine old collegiate church, and a curious Town Hall. The latter building

is supported on wooden pillars, which are now in a very rotten condition, and should be replaced by new ones before they cause the destruction of the edifice.

Before leaving the subject of British remains I must not forget the tumuli which are very numerous on our Downs. They are of various forms, some round, some oval, and some of larger size, surrounded by a small ditch. Many of them have been opened, and pottery, flint implements, etc., found in large quantities.

Besides Chisbury, there are three other principal Saxon camps in the neighbourhood, Oldbury, Barbury, and Liddington. The first of these is on a hill overlooking the Bath road about nine or ten miles from here and is rendered conspicuous by the large obelisk erected there by the Marquis of Lansdowne. This obelisk is easily seen from our Cricket ground or from any high hill about here, though it hardly looks so far off as it really is.

Oldbury camp is of very irregular shape, following the windings of the crest of the hill. On the side nearest to Calne the slope is very steep and a white horse in a trotting attitude has been cut out in the turf. This animal is called the "Cherhill White Horse," and is much stouter and stronger built than its Marlborough rival, and, if I remember right, is better groomed and kept clean. I may add that, like most of these hill forts, Oldbury affords a magnificent view extending over the beautiful country about Calne and Bowood.

The remaining camps, which with Oldbury formed part of a long chain of hill forts, are Barbury and Liddington, the former of which you reach by the old Swindon road, the latter by the new. They are very similar; Barbury is rather the larger and stronger, the circuit of the ramparts being about half a mile, and their height forty feet. The Saxon Chronicle has recorded that in the year 556 "Cynricus et Ceawlinus acrè dimicabant contra Britannos ad Berenbyrig." Berenbyrig is probably Barbury.

I have now I believe mentioned all the ancient works in this neighbourhood. Every one of them is well worth seeing and none are hard to reach, if the archæologist will only make good use of his legs. In conclusion I must refer those who wish for fuller information to the valuable works of Sir Richard Colt Hoare, and to several papers and pamphlets by the Rev. A. C. Smith.

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There were 36 persons present: 1 Hon. Member, 21 Members, and 14 Visitors.

## MEETING HELD MAY 28TH, 1869.

There were no exhibitions, in order to give more time for the lecture, which was given by F. Giles, and illustrated by experiments, on Statical Electricity.

E. Owen and E. A. Champneys were elected members.

There were 80 persons present: 1 hon. member, 23 members, and 56 visitors.

## MEETING HELD JUNE 11TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:—

Some coins by W. G. Fellowes.

Key of the Old Marlborough Castle, by Mr. Wooldridge.

A typical series of bird's heads, twelve in number, among which were those of the Snipe, Water-rail, &c., by G. E. Manisty.

A special vote of thanks to the Rev. C. Soames was proposed by the President and carried unanimously.

The Heads of Sections gave their reports for the half-year.

E. F. Vicars was elected a member.

The following paper was read by R. Rooke, on

### THE PLURALITY OF WORLDS.

SOME of you may remember the words of Shakespeare on this subject, for he has written upon this, as upon all other things. Lorenzo and Jessica are standing together in the night, and Lorenzo speaks these words to his love:

"How sweet the moonlight sleep upon this bank
Here will we sit, and let the sounds of music
Creep in our ears; soft stillness, and the night
Become the touches of sweet harmony.
Sit Jessica. Look how the floor of heaven
Is thick enlaid with patines of bright gold.
There's not the smallest orb which thou behold'st
But in his motion like an angel sings
Still giving to the young-eyed cherubins:
Such harmony is in immortal souls."

Such was the verdict of what I may call poetic intuition, unassisted by science, and when, with fresh improvements of the telescope, new worlds and new systems of worlds, as it seemed, were revealed to the eye, how could science fail to strengthen the verdict of the imagination? Whether it did so or not, is the question which I have to discuss to-night, but one great step had been gained, the Plurality of Worlds was no longer a subject for idle dreaming, but for real and carefully tested knowledge.

There are two methods by which we can examine a question of this nature. We can look at the world around us, with which we are aquainted and on which we can form comparatively certain opinions: if we can find any operations in Nature, which seem similar to those of which we cannot as yet determine anything with certainty, we can apply our knowledge of discovered systems and facts upon the Earth to similar systems, as it would seem, in the Heavens, and by thus comparing the unknown with the known, we can deduce results of which we should otherwise be ignorant. This is called the Argument from Analogy. It is obviously insufficient and liable to advance theories without sufficient *data*; in the absence however of direct evidence, and when used in moderation, reasoning from analogy becomes extremely valuable.

The other method by which we are enabled to pronounce a decision upon the question, with which we are occupied to-night, in our actual knowledge, however confined it may be, of the constitution of the heavens.

Let us first then see what light is thrown upon the question by analogy, and after having proved some principle to be at least *probable*, let us then test it by facts, and if the evidence of facts agrees with our theory, we may safely pronounce it settled, as far as lies in our power.

What then is the main argument, by which supporters of the Plurality of inhabited worlds endeavour to prove their existence? Is it not this? On looking at the sky in the night time, they assert you may see some thousand stars. Use however a telescope of no very great powers, and this number will be indefinitely increased, while a telescope of still greater powers will reveal an increasing number, and, more than this, resolves what seemed before stars, into nebulæ, or vast collections of stars. Many of these, they say, are even of greater magnitude than our sun, and around these suns, no doubt, innumerable systems roll; as far as space can be pierced by the human mind, it would seem to be filled by these huge luminous bodies: knowing all this, how can we doubt that many, if not all of them, are inhabited by living and sentient beings. Is it conceivable that space could be thus wasted? Are all these worlds but desolate wastes, while our own planet alone is inhabited? Such are the arguments, and it must be confessed that they are not without weight, by which the Plurality of Worlds is supported.

But is there nothing analogous on our own earth to this *apparent* waste of matter and space in the heavens? Geology supplies us with a counter argument. For it is now acknowledged on almost all sides that this earth has existed for an innumerable series of ages. It is unnecessary for me to dilate upon or defend this, now certain, theory, except so far as it may enter within the province of our subject to-night. For countless ages this earth was, as it is believed, a globe of desolate fire, inhabited by nothing, and, according to the arguments of our opponents, a waste in the economy of the creation. For ages afterwards it was uninhabited by living beings, or, if inhabited, by creatures of the lowest orders, indeed we may say that for every million miles of *space* which our opponents point to as wasted, we can bring forward a million years of *time* in which the earth was barren of life. Yet it seemed good to our Maker that these countless series of time, which almost madden us when we attempt to realise them, should roll out their appointed course, until this little world was perfected. And if time has thus been lavishly expended in the creation of human men, why should we deny, because it seems strange to us, that space has been filled in the same manner? If man was the object, for which age upon age was spent, why should not our planet in like manner be the centre of the vast universe? And is it not a more reasonable theory to suppose that these stars are worlds in a state of preparation, as our world once was, instead of peopling the universe with dream creatures? But, I confess, that I see no need even for this supposition.

Such then is the argument from Analogy, which Geology gives to us; is it supported by facts? that is to say, would the conditions of life in the planets and stars beyond us be fatal to human beings? Is it impossible that the Moon be after all inhabited by men? Into this question, and it is an interesting one, I will now enter.

Beginning then at the outskirts of Creation let us examine the Nebulæ. For some time the following theory was held with regard to them; it was called the Nebular Hypothesis. The Nebulæ are merely vast masses of luminous vapour, loosely held together, out of which, by the concentration of their substance upon a centre, future suns might be formed.

When, however, telescopes of greater powers were turned upon these mysterious masses of vapour, it was found that nearly all nebulæ were resolvable into clusters of stars of a vast size, and the theory fell to the ground. But when we speak of stars we must clearly understand what the word "star" here means, for it is a term of somewhat indefinite meaning. It would appear that these stars into which nebulæ are resolvable, are of a separable nature, and have run into lumps of light. And when we ask of what substance they are composed, we have one fact, which perhaps may guide us aright. Nebulæ and the tails of comets present exactly the same

appearance in the sky; now we have ascertained that tails of comets are luminous vapour, and it seems highly probable that this is the substance of which the stars of the nebulæ are composed.

The nebulæ therefore would appear to be long patches and streaks of a matter which is altogether incoherent and gaseous: of immense tenuity, they seem to have no definite system, for the rolls of vaporous matter vary exactly as columns of smoke, or the changing clouds of an English sky. No greater contrast could be found than between our solar and the so called spiral nebulous systems. The one, complete in itself and governed by laws of unerring certainty, the others, producers of a confused, incoherent, and indiscriminate matter. On the one hand we look upon order, on the other chaos.

It is therefore obviously ridiculous to people the nebulæ, unless it be with thin and fiery creatures, such as one might imagine to be the tenants of comets, but when it is possible to fill our fires with such beings, why travel to the Nebulæ?

I pass by the Clusters of Stars (which seem to be regulated by the same laws as Nebulæ on a smaller scale, and it is equally improbable that they are inhabited), and before discussing our own system, we will examine the Fixed Stars.

Now it is obvious that if the Fixed Stars are to be centres of inhabited systems, which have not as yet been discovered, they must present a strong resemblance to our own Sun. Is this the case? Do the fixed stars in any ways so resemble our Sun, as to lead us to believe that round them, as round the Sun, roll inhabited worlds?

The first contrast which appears between the two is the series of *changes* which are observed in the Fixed Stars. Sirius, for instance, is at one time of a red colour, at another, white, leading us to believe that this star has even within the range of a thousand years been subject to vast changes of constitution. Still more important is our knowledge that these fixed stars often *vanish*; it has been found that in 2000 years 200 stars change, and therefore in only a million years, 100,000 stars would have altered in their constitution. And what do these facts tell us? Why, surely this, that these stars have as yet not reached any permanent condition, but are constantly liable to such revolutions of nature, as would sweep to the winds any theory of inhabitants, either for themselves, or for their supposed planets.

We now draw near to our own Planetary System. Hitherto we have somewhat groped in the darkness, but it was unavoidable: now we can feel our way with more light and knowledge, and therefore with more certainty.

You are of course aware that our system consists of Planets, of which our own earth is nearly the midmost, and that these roll round the sun, at different distances, and therefore with varying times of revolution. One after the

other will be laid before you now, and one after the other will be proved uninhabitable.

But before examining them successively it will perhaps be as well to take one of the most prominent, and shewing the impossibility of any beings, resembling in the least degree human creatures, existing on it, break down the theory that *all* the planets are inhabited.

With this view let us look at Neptune. Its distance from the sun is thirty times that of the earth. To the supposed inhabitants but little sun-light would come, for the sun would look a mere star—what Jupiter seems to us. The modicum of light and heat would be but scanty, $\frac{1}{900}$th of that on the earth. It would seem at least improbable that life could be maintained under these conditions.

We will now strengthen our case by examining the Moon. Here, if anywhere, we ought to pronounce a decisive opinion. So near does the moon lie to us, that astronomers have been enabled to map out her surface as accurately as that of the earth. Ranges of mountains have not only been clearly discerned, but have even been named. We are told that spaces, no larger than our own railway stations, can be distinguished. Of what then does the surface of the Moon consist? Of desolate volcanoes, and extinct craters; of dreary wastes of petrified streams of lava, which flowed forth in former ages. Nowhere are there signs of life, either vegetable or animal: we are not even face to face with the dreariness and silence of death, for life has never existed.

All therefore agree that it would be impossible for such a world to be inhabited. No atmosphere exists which would support them; this is conclusively proved by the absence of all the optical effects of an atmosphere in eclipses; it is therefore hard to conceive creatures who exist without air or water. And lastly, there is one conclusive argument, which destroys the idea, if ever any one entertained it, of an inhabited Moon. Although the surface of the Moon has been observed for hundreds of years, not the slightest change has ever been detected.

Suppose inhabitants of the Moon to have ever existed, and to have possessed telescopes, they would have discerned perpetual changes occurring on the surface of our globe. Now, it would have been the clearing of the huge forests of Germany or of America, now the establishment of the vast manufactories of Birmingham or Manchester, which darken, for miles and miles round, the atmosphere with their columns of smoke. An astromer of the Moon, watching these appearances, would have justly concluded them to have been the production of some living agency on the earth. Unfortunately the absence of all such changes precludes the possibility of observant astronomers in the Moon.

We may now confidently assert that *all* the bodies of the solar system are not inhabited, I will now try to prove that *none* but the earth are.

Commencing with the outer planets we will examine Jupiter. The mass of Jupiter is 333 times that of the earth. His diameter is eleven times greater. His density, however, compared with that of the earth, is only as 1 to 4, that is a quarter lighter. Of what substance therefore can a planet be formed, which exceeds the earth greatly in bulk, but whose material is considerably lighter? In all probability it is water. Other circumstances point to the same conclusion. Jupiter is of an oblate form, that is, that of an orange; now we have all learnt in our Geography Manuals that the earth is to a certain degree shaped in this way, but the oblateness of Jupiter is developed to a far greater extent. This can only be accounted for on the supposition that it is composed of water. For his peculiar form would be produced by the rotation of a fluid mass. There is yet another fact which seems to render this theory irresistible. Astronomers have observed bands of darker and lighter colour upon the face of Jupiter, which change from time to time. They have therefore concluded that these bands are vast volumes of vapour, which arise from the seas, with which Jupiter is covered. Have you ever on a stormy day looked out on the sea, and seen dark angry masses of cloud sweep landward from the ocean? Was not your mind almost oppressed with a sense of vastness? Imagine then these stupendous volumes of mist and vapour rising up ever from the almost limitless waters of the planet, imagine a world wrapped always in impenetrable gloom and darkness, with no sunlight, no day, nothing which makes this world so dear to us, and you will have formed some conception of Jupiter.

Is it possible that such a planet should be inhabited? could the wildest fancy select such a habitation for the lowest creatures? Let us consider a few of the conditions of their life.

Jupiter, though of lighter substance than the earth, has more of it, and therefore his greater mass makes bodies ponderate proportionally more to him. The force of gravity in fact is about 2½ times greater than that of the earth. To lift your leg on Jupiter would require 2½ times the amount of force than on the earth. Your clothes would weigh with 2½ times greater heaviness on your bodies. It is clear then that Jupiter could not be inhabited by any human creatures. And it is difficult to consider what species of animals they could be, when no material as heavy as bone has been found. Clearly skeletons would be out of the question. We can only imagine mere "cartilaginous, glutinous masses" peopling their cold and shiny waters, moving about without animation under the clouds of vapour—such a life for even the lowest creatures would indeed be a life in death.

What is the use then of the Satellites of Jupiter? What was the use I reply of the countless ages in which the earth was uninhabited, of the ages

afterwards, when corals and madrepores, shell-fish, and belemnites, were the sole tenants of this fair earth?

The same arguments apply to Saturn. Light and heat are one-ninetieth of the light and heat on the earth. Its density is about that of cork, we are forced therefore to the conclusion that Saturn is only a globe of vapour. Its creatures could only therefore be of a very sluggish nature, so much so as almost to be lifeless. Shrouded by their humid skies their existence would not seem to be of the most enviable. It is extremely problematical whether they could possess eyes, and it therefore idle to join the laments of a supporter of the Plurality of Worlds, who regrets that they would suffer under a solar eclipse for 15 years, owing to the interposition of their Ring between them and the Sun.

But still stronger is the case against Uranus and Neptune, the latter of which we have already discussed; light and heat would in these planets be $\frac{1}{360}$ and $\frac{1}{900}$ of the light and heat upon the Earth.

Drawing nearer to the sun we approach Mars. The density of Mars is equal to that of the earth, but its mass is so much smaller, as to render the force of gravity of Mars half that upon the earth. It would therefore seem impossible that beings, constituted in any way like us could inhabit Mars under these conditions. Yet there are not a few signs that life of some kind may exist upon this planet. Ruddy colours have been observed upon the disc, and it has been supposed that these may be continents. Clouds seem to appear, and then to vanish; brilliant white spots are also seen, which gradually grow less and less as they approach nearer to the sun: astronomers have conjectured from this phenomenon the existence of snow, and for the formation of snow an atmosphere would be required. We have in this undoubtedly a strong case for the possibility of inhabitants on Mars. As I have before remarked, the conditions of gravity and light and heat would render it impossible for human beings to exist upon it. Possibly Mars may be a world in a state of preparation, and, as such, may be tenanted by some unknown monsters as our world once was in past ages. It must, however, be remembered that the evidence, gained from an examination of other planets, seems altogether to negative even this supposition.

Of the small bodies which revolve between Jupiter and Mars little need be said. They appear to be mere crude masses of metal and earth. It is uncertain whether they are even approximately spherical.

Passing still nearer to the sun, we will discuss the planet Venus. Although so near to the sun, astronomers know very little of her constitution. She is almost as heavy as the earth, almost as large. Heat and light would have double the force of heat and light upon the earth. Her surface may resemble that of the Moon, a desolate waste of extinct craters and petri-

fied lava. More probably the fierce ardour of the sun has worn it into a smoothness, of which we can form no conception; the tendency of the action of the sun would be to lower all hills and risings, and to reduce all to one level. On such a planet, life could not exist, it would droop and perish before the withering sun. "Microscopic creatures with siliceous coverings, which are said to be almost indestructible by heat," may tenant the planet Venus, of other inhabitants it is absurd to dream.

If Venus is uninhabitable, what must Mercury be? Far smaller than the earth, it is enveloped by a heat, which is seven times that of the earth. We fear that even the fire-creatures of Venus would not even exist here.

We have now, so to speak, traversed the whole Creation, from the Nebulæ to the Moon. Everywhere we have met with the same result, for nowhere have we seen such indications as would lead us to assume life. The earth, then, would seem to be the only inhabited globe in the universe. Occupying such an all important position, we surely expect to find certain conditions which she alone enjoys, and for which she is dependent on other planets.

These we do find, and in detailing them to you, I may observe that they constitute the "Argument from Design."

From all that we know of the worlds without us, it would seem that water and vapour are driven out from the sea into outer regions of a vast circuit. The Nebulæ are apparently composed solely of vapour, the more distant planets, as we have shewn, of water and ice. On the other hand the solid masses stand nearer to the focus of light and heat.

The earth alone is composed of both solid and fluid. Here alone do we find that nice adaption of air and water and solid earth, which constitutes our globe. A few hundred miles on either side of our present position, and we should be pierced by cold or heat.

You may have observed, when wet objects are placed before a kitchen fire, that the water is driven away from the fire in vapours. It is a homely illustration but in this way the volumes of superfluous vapour and water have been driven away from the sun. Instead of wandering about, they have been packed "into rotating masses," they have been wound neatly into balls, for what are these planets and stars but fixed receptacles of vapours?

The Earth's orbit may be called the temperate zone of the Universe. Only here are hot and cold combined, moist and dry, air and water: only here would it be possible for the delicate organisation of human life to exist, only here has man, made in God's likeness, the flower of the whole creation, his dwelling-place, for here alone exist the almost infinite conditions of his life. Instead of making a multitude of worlds, more or less similar to one another, it has seemed good to the Creator to construct *one* world, which it is presumptous in man to call imperfect, since it includes and transcends all that we can conceive of perfection.

Our whole souls seem to revolt at the idea of an infinity of worlds, for it is expressly opposed to everything which either instinct or revelation teaches us. It is as opposed, I believe, to reason. On the earth alone are men; we stand at the head of the creation; and although it is impossible to absolutely disprove the wild workings of the imagination on this matter, they are both hurtful to the mind and wholly without reason, for why, when we can people the air and the fire of our own world with the creatures of our fancy, should we travel to the planets, in which we find only indications of a contrary nature?

I conclude then with the apology of Jewell for his opinions, and it is to my mind one of the masterpieces in our language:—

"It may be that all the other bodies which we can discern in the Universe shew the greatness of this work, and are rolled into forms of symmetry and order, into masses of light and splendour, by the vast whirl which the original creative energy imparted to the luminous element, out of which they were formed. The planets and the stars are the lumps, which have flown from the potter's wheel of the Great Worker;—the shred-coils, which, in the working, sprang from his mighty lathe; the sparks which darted from his awful anvil when the solar system lay incandescent thereon: the curls of vapour which rose from the great cauldron of creation, when its elements were separated."

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For nearly the first time during the present half-year a discussion arose out of the paper and was conducted with great animation as long as time allowed.

The President made a few general remarks on the state of the Society.

There were 77 persons present: 1 honorary member, 27 members, and 49 visitors.

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## ENTOMOLOGY.

As usual an asterisk signifies that the species was new to our List. To the name of every insect new to the List is attached the corresponding number in Stainton's "Manual of British Moths."

Names of those whose initials occur:—

| | |
|---|---|
| A.A. ... ... | ... A. Armstrong, Esq. |
| H.R.A. ... ... | ... H. R. Armstrong. |
| E.G.B. ... ... | ... E. G. Barrow. |
| G.C.N.B. ... ... | ... G. C. N. Bryan. |
| J.H.C. ... ... | ... J. H. Clarke. |
| J.G.C. ... ... | ... Mr. J. G. Crow. |

W.H.C. ... ... ... W. H. Churchill.
W.B.D. ... ... ... W. B. Denshire.
J.B.F. ... ... ... J. B. Fuller.
W.D.F. ... ... ... W. D. Fenning.
B.J.G. ... ... ... B. J. Guillemard.
S.W.G. ... ... ... S. W. Greenhow.
A.H.F.G. ... ... ... A. H. F. Greville.
L.H. ... ... ... L. Hart.
H.M.H. ... ... ... H. M. Hilton.
A.C.H. ... ... ... A. C. Hilton.
A.F.H. ... ... ... A. F. Höffmann.
R.A.I. ... ... ... R. A. Illingworth.
F.J.H.J. ... ... ... F. J. H. Jenkinson.
J.A.L. ... ... ... J. A. Lefroy.
J.F.L. ... ... ... J. F. Laver.
G.E.M. ... ... ... G. E. Manisty.
C.G.H.M. ... ... ... C. G. H. Mann.
H.M. .. ... ... H. Manders.
W.M. ... ... ... W. Mansell, Esq.,
J.B.O. ... ... ... J. B. Oakeley.
R.P. ... ... ... R. Phayre.
H.A.M.P. ... ... ... H. A. M. Power.
H.S.G.R. ... ... ... H. S. G. Richardson.
A.H.B.R. ... ... ... A. H. B. Reynardson.
S.A.R. ... ... ... S. A. Rogers.
C.A.S. ... ... ... C. A. Sladen.
J.S. ... ... ... Rev. J. Sowerby.
H.C.S. ... ... ... H. C. Spry.
C.E.T. ... ... ... Rev. C. E. Thorpe.
J.V. ... ... ... Mr. J. Velvin.
E.H.W. ... ... ... E. H. Wyatt.
F.F.W. ... ... ... F. F. White

## RHOPALOCERA.

| *Name.* | | *Date* | *Captor.* |
|---|---|---|---|
| Gonepteryx Rhamni ... | Brimstone ... | Feb. 5 ... | J.S.; A.A. |
| | | April 5 ... | H.A.M.P. |
| Pieris Brassicæ ... ... | Large white ... | April 8 ... | E.H.W.; F.J.H.J. |
| „ Rapæ... ... ... | Small „ ... | April 13 ... | C.E.T. |
| | | April 14 ... | J.S. |
| | | April 24 ... | R.A.I. |
| „ Napi ... ... ... | Green-veined ... | April 27 ... | J.B.F. |

| *Name.* | | *Date.* | *Captor.* |
|---|---|---|---|
| Anthocharis Cardamines | Orange-tip ... | April 25 ... | L.H. |
| Lasiommata Ægeria ... | Speckled-wood | April 26 ... | B.J.G.—J.B.F. |
| „ Megæra ... ... | Wall... ... ... | April 30 ... | G.E.M. |
| Cœnonympha Pamphilus | Small Heath ... | May 26 ... | H.M.H.—J.H.C. |
| Cynthia Cardui ... ... | Painted Lady ... | May 30 ... | H.M.H. |
| Vanessa Atalanta ... ... | Red Admiral ... | April 7 ... | F.F.W. |
| „ Io ... .. ... | Peacock ... ... | April 8 ... | J.B.O.—H.M.H. |
| „ Urticæ ... ... | Tortoiseshell ... | Feb. 21 ... | H.C.S.—R.P. |
| Argynnis Euphrosyne | ... ... ... ... | May 22 ... | H.M.H. & F.J.H.J. A.C.H. & W.D.F. |
| „ Selene ... ... | ... ... ... ... | June 8 ... | F.J.H.J. |
| Nemeobius Lucina... ... | Duke of Burgundy | May 26 ... | J.H.C.—H.M.H. |
| Chrysophanus Phlæas ... | Small Copper ... | April 25 ... | C.E.T. |
| Polyommatus Alsus ... | Bedford Blue ... | June 6 ... | H.M.H.—F.J.H.J. |
| * „ Argiolus (50) ... | Holly „ ... | April 26 ... | J.B.F.—B.J.G. |
| „ Alexis .. ... . . | Common „ ... | April 25 ... | G.E.M.—G.C.N.B. |
| „ Agestis ... ... | Brown Argus ... | May 26 ... | H.M.H. |
| Thymele Alveolus ... ... | Grizzled Skipper | May 11 ... | F.J.H.J.—J.H.C. |
| Thanaos Tages ... ... | Dingy „ ... | May 12 ... | H.M.H.—J.H.C. |
| Pamphilus Sylvanus ... | Large „ ... | June 8 ... | F.J.H.J. |
| | SPHINGINA. | | |
| Smerinthus Populi... ... | Poplar Hawk ... | May 24 ... | J.G.C. |
| „ Ocellatus ... ... | Eyed Hawk ... | June 3 ... | W.B.D. |
| „ Tiliæ ... ... ... | Lime Hawk ... | June 9 .... | J.V. |
| Sphinx Ligustri ... ... | Privet Hawk ... | May 31 ... | W.H.C. |
| Chœrocampa Elpenor ... | Large Elephant | June 8 ... | C.A.S. |
| „ Porcellus ... ... | Small Elephant | June 11 ... | J.V. |
| Macroglossa Stellatarum | Humming-bird | April 25 ... | H.M. |
| | | May 7 ... | G.C.N.B. |
| Sesia Fuciformis ... ... | Bee Hawk-moth | May 23 ... | C.A.S. |
| | BOMBYCINA. | | |
| Hepialus Hectus ... ... | Golden Swift ... | June 5 ... | H.M.H.—J.H.C. |
| „ Lupulinus ... ... | Common „ ... | June 5 . ... | H.M.H. |
| Diloba Cæruleocephala | Figure of 8 (larva full grown) ... | June 9 ... | F.J.H.J. |
| Porthesia Auriflua... ... | Gold-tail (larva ⅓ of an inch) ... | May 2 ... | A.H.F.G. |
| Gnophria Rubricollis ... | Red-tail (seen) | June 8 ... | F.J.H.J.—H.M.H. |
| Arctia Caja ... ... ... | Tiger (larva) ... | April 8 ... | S.W.G. |

| *Name.* | | *Date.* | *Captor.* |
|---|---|---|---|
| Nemeophila Plantaginis | Wood-tiger ... | June 2 ... | H.M.H. |
| Phragmatobia Fuliginosa | Ruby „ ... | April 25 ... | J.F.L. |
| Spilosoma Menthrasti ... | Ermine ... ... | June 4 ... | B.J.G. |
| „ Lubricepeda ... | Buff Ermine ... | May 21 ... | G.E.M. |
| Diaphora Mendica ... ... | Muslin ... ... | May 2 ... | A.F.H. |
| Callimorpha Jacobeæ ... | Cinnabar ... ... | May 18 ... | J.A.L. |
| Lasiocampa Quercus ... | Oak-eggar (larva) | May 9 ... | C.A.S.—A.H.B.R. |
| „ Lanestris ... ... | SmallEggar(bred) | April 3 ... | C.A.S. |
| Drepana Falcataria ... | (off oak) ... ... | June 9 ... | H.M.H. |
| | NOCTUÆ | | |
| Mamestra Brassicæ ... | Cabbage moth... | May 29 ... | H.G.M. |
| Grammesia Trilinea ... | (at light)... ... | June 10 ... | F.J.H.J. |
| Agrotis Exclamationis ... | (at light)... ... | June 10 ... | F.J.H.J. |
| Tæniocampa Gothica ... | ... ... ... ... | April 8 ... | G.E.M. |
| „ Stabilis ... ... | (bred from pupa) | March 12 ... | H.M.H.; C.A.S. |
| | (caught)... ... | April 9 ... | G.E.M. |
| Phlogophora Meticulosa | Angle shades ... | March 25... | Mr. Hawkins. |
| | | May 4 ... | G.E.M. |
| Plusia Gamma ... ... | silver Y ... ... | May 11 ... | J.B.O.; J.B.F. |
| Gonoptera Libatrix ... | Herald ... ... | April 18 ... | G.E.M. |
| Euclidia Mi ... ... ... | (seen) ... ... | June 9 ... | F.J.H.J. |
| | GEOMETRINA. | | |
| Rumia Cratægata ... ... | Brimstone ... ... | May 11 ... | G.E.M. |
| Selenia Illunaria ... ... | Early Thorn ... | April 15 ... | G.E.M. |
| Iodis Lactearia ... ... | Small Emerald | May 25 ... | H.M.H.—J.H.C. |
| *Ephyra Porata (556) ... | ... ... ... ... | June 5 ... | H.M.H.—F.J.H.J. |
| „ Punctaria ... | ... ... ... ... | June 6 ... | H.M.H. |
| * „ Pendularia (561) | ... ... ... ... | June 5 ... | F.J.H.J. |
| * „ Omicronaria(559) | ... ... ... ... | June 8 ... | F.J.H.J. |
| Asthena candidata ... | ... ... ... ... | May 24 ... | F.J.H.J.—H.M.H. |
| * „ Sylvata (565) ... | ... ... ... ... | June 2 ... | H.M.H. |
| Cabera Pusaria ... ... | ... ... ... ... | May 25 ... | H.M.H.—J.H.C. |
| „ Exanthemata ... | ... ... ... ... | May 25 ... | H.M.H. |
| Corycia Punctata ... ... | ... ... ... ... | May 20 ... | J.B.F. |
| „ Taminata ... ... | ... ... ... ... | May 22 ... | B.J.G. |
| Acidalia Remutata ... | ... ... ... ... | May 20 ... | H.M.H.—J.H.C. |
| Halia Wavaria ... ... | ... ... ... ... | May 3 ... | G.E.M. |
| Strenia Clathrata ... ... | Latticed Heath | May 11 ... | H.M.H. |
| Lozogramma Petraria ... | ... ... ... ... | May 10 ... | J.B.F. |

| *Name* | | *Date.* | *Captor.* |
|---|---|---|---|
| Fidonia Atomaria ... ... | Heath-moth ... | June 9 ... | H.M.H. |
| Minoa Euphorbiata ... ... ... ... ... | | June 6 ... | H.M.H.—F.J.H.J. |
| Abraxas Grossulariata... | Currant moth (larva) | May 26 ... | H.M.H. |
| Lomaspilis Marginata ... ... ... ... ... | | May 12 ... | J.B.F. |
| Hibernia Progemmaria... ... ... ... ... | | Feb. 18 ... | W.M. |
| Laurentia Miaria ... ... ... ... ... ... | | May 22 ... | H.M.H. |
| Eupithecia Vulgata ... | (at light) ... | May 4 ... | H.M.H. |
| Melanthia Ocellata ... | Purple bar ... | June 9 ... | F.J.H.J. |
| Melanippe Hastata ... | Argent & Sable | June 5 ... | H.M.H.—F.J.H.J. |
| „ Biriviata ... ... ... ... ... | | May 11 ... | A.C.H. |
| „ Montanata ... ... ... ... ... | | May 26 ... | J.H.C. |
| „ Fluctuata ... ... ... ... ... | | April 28 ... | R.A.I. |
| Camptogramma Bilineata | Yellow Shell ... | June 10 ... | F.J.H.J. |
| Cidaria Corylata ... ... ... ... ... ... | | June 6 ... | F.J.H.J. |
| *Anaitis Plagiata (765) ... ... ... ... | | June 1 ... | H.M.H.—H.S.G.R. |

PYRALIDINA.

| | | |
|---|---|---|
| Herminia Barbalis... ... ... ... ... ... | June 7 West Woods ... | H.M.H.—F.J.H.J. |
| „ Nemoralis ... ... ... ... ... | June 9 West Woods ... | H.M.H. |
| Pyrausta Purpuralis ... ... ... ... ... | May 11 ... | H.M.H.—J.H.C. |
| „ Ostrinalis ... ... ... ... ... | May 1 ... | H.M.H. — A. H. B. R. |
| Botys Pandalis ... ... ... ... ... ... | June 7 ... | F.J.H.J.—H.M.H. |
| „ Fuscalis ... ... ... ... ... ... | June 5 ... | F.J.H.J. |
| Pionea Forficalis ... ... ... ... ... ... | June 12 ... | F.J.H.J. |
| Scopula Olivalis ... ... ... ... ... ... | May 30 ... | H.M.H. — H.S.G.R. |

Besides the above we may notice

| | | |
|---|---|---|
| Humble bee ... ... ... ... ... ... ... | Feb. 26 ... | S.A.R.—J.B.O. |
| Wasp ... ... ... ... ... ... ... ... | Feb. 20 ... | E.G.B. |
| Common bee ... ... ... ... ... ... ... | Quite abundant in the warm days in February. | |
| Hornet ... ... ... ... ... ... ... ... | June 7 in Manton Copse | F.J.H.J. |
| Cockchaffer ... ... ... ... ... ... ... | April 9 | H.R.A. |

## NOTES, &c., ON INDIVIDUAL SPECIMENS.

The sudden change begun on April 8th, which hurried us straight from snow and hail to bright sunshine, attracting out a great number of hybernating insects, which had not made any appearance since one or two bright days in the beginning of February. The wet weather, however, that set in at the beginning of May, put an end to our Entomological researches, and not till the end of that month did insects begin to appear in any abundance.

The first thing we may notice this year is the extraordinary dearth of "whites," also the lateness of the "Orange tips," which, in abundance, seem to have taken their places.

A new "blue" has been added to our list of butterflies—*Argiolus*—the "Holly" blue. It was first discovered in Rabley Copse in some abundance, but since then single specimens have been taken near the Butts, by J. B. Fuller in the Forest, on the Common by E. S. Preston, and at Preshute by G. C. N. Bryan.

Of the *Sphingina*, the more important captures are the large Elephant, *(C. Elpenor)* at Clatford by C. A. Sladen, the Small Elephant *(C. Porcellus)* near the Butts, by Mr. J. Velvin, and the Bee-hawk *(S. Fuciformis)* also near the Butts, by C. A. Sladen.

Of the *Bombycina* the only one to notice is the "Ruby Tiger" taken flying along the Bath road.

*Geometrina.*—Two fine specimens of *M. Hastata*, the "Argent and Sable" moth were taken in the West Woods on the same day, the one by H. M. Hilton and the other by F. J. H. Jenkinson. This insect has not been taken since 1866, when two also were taken not far from the same spot.

Three new species of the genus Ephyra have been added to our list. We may remark that two years ago H. T. Stainton, Esq., remarked on the probability of our capturing *Pendularia* in the West Woods. Now it has been taken. The other two were *Omicronaria* taken near Manton Copse, and *Porata* in the West Woods.

*Asthena Sylvata* is also new to our list. Two specimens, at intervals, have been taken in Manton Copse.

It is extraordinary that *Anaitis Plagiata*, the "Treble bar," should not have turned up before, for it has been in excessive abundance, during June this year.

N.B.—We must correct a misprint in the *Geometrina*. What has always been noted as *Immutata* is really *Remutata*.

H. M. HILTON,
Head of the Section.

# BOTANICAL NOTICES.

THE accompanying List will be a sufficient proof of the activity of the Section during the past half year. Endeavours are being made to work out the duration of the different plants, and hence, though the list contains a goodly number of dates, the other notices are far more numerous. In fact, the dates already registered (each one involving at least an extra entry) amount to nearly 6000. This, added to the long list of new species and new localities shows an activity of the Botanical section never greater than during the past half year.

The mildness of the winter was such that a greater number of plants were not killed, and hence during the early months a large number of plants were in flower and continued so till replaced by those which had sprung up this year. A *W* has been prefixed to those plants which lasted all the winter.

As usual an Asterisk (*) indicates that the specimen observed was a cultivated one. "By" that the specimen, when observed, appeared to have been in flower a day or two.

Especial thanks are due to the Rev. J. Sowerby, F. E. Thompson, Esq., and F. Storr, Esq., without whose assistance it would have been impossible to have kept the register so complete as it is.

Names of those whose initials occur in the following list

| | |
|---|---|
| H.R.A ... ... ... | H. R. Armstrong. |
| W.A. ... ... ... | W. Atthill. |
| C.St.J.B. ... ... ... | C. St. J. Beauclerk. |
| R.H.B. ... ... ... | R. H. Bicknell. |
| J.G.B. ... ... ... | Rev. J. G. Bleeck. |
| H.E.B. ... ... ... | Rev. H. E. Booth. |
| M.B. ... ... ... | Miss Mabel Bradley. |
| T.B. ... ... ... | Mr. T. Burgess. |
| C.R.C. ... ... ... | C. R. Carr, Esq., |
| D.A.C. ... ... ... | D. A. Coles. |
| E.H.D. ... ... ... | E. H. Davis. |
| G.W.D.L. ... ... | Rev. G. W. DeLisle. |
| H.S.D. ... ... ... | H. S. Dickinson. |
| S.B.D. ... ... ... | S. B. Dixon, Esq. |
| C.R.D. ... ... ... | C. R. Draper. |
| J.W.D. ... ... ... | J. W. Dudding. |
| W.D.F. ... ... ... | W. D. Fenning. |
| W.F. ... ... ... | W. Fergus, Esq., M.D. |
| S.C.V F. ... ... ... | S. C. V. Filloul. |

J.B.F. ... ... ... J. B. Fuller.
E.A.F. ... ... ... E. A. Furneaux.
J.H.G. ... ... ... J. H. Garland.
J.B.G. ... ... ... J. B. Gilmore, Esq.
R.M.B.G.... ... ... R. M. B. Glasse.
F.G. ... ... ... F. Goodchild.
H.G. ... ... ... H. Gordon.
B.J.G. ... ... ... B. J. Guillemard.
E.G. ... ... ... E. Gunner.
E.L.H. ... ... ... E. L. Hesketh.
P.L.H. ... ... ... P. L. Hesketh.
A.C.H. ... ... ... A. C. Hilton.
H.M.H. ... ... ... H. M. Hilton.
J.W.H. ... ... ... J. W. Hockin.
A.D.B.H. ... ... ... A. DeB. Hovell.
F.J.H.J. ... ... ... F. J. H. Jenkinson.
H.T.K. ... ... ... H. T. King.
J.F.L. ... ... ... J. F. Laver.
J.A.L. ... ... ... J. A. Lefroy.
D.E.L. ... ... ... D. E. Leighton.
H.M. ... ... ... H. Macdougall.
G.E.M. ... ... ... G. E. Manisty.
G.C.M. ... ... ... G. C. Mansel.
W.M. ... ... ... W. Mansell, Esq.
G.E.Me ... ... ... G. E. Mew.
J.B.O. ... ... ... J. B. Oakeley.
W.S.O. ... ... ... W.S.Owen
E.P. ... ... ... E. Peters.
E.S.P. ... ... ... E. S. Preston.
T.A.P. ... ... ... Rev. T. A. Preston.
C.T.R. ... ... ... C. T. Richardson.
H.S.S. ... ... ... H. S. Sankey.
F.H.S. ... ... ... F. H. Shelley.
H.E.S. ... ... ... H. E. Sieveking.
C.A.S. ... ... ... C. A. Sladen.
T.N.H.S.... ... ... T. N. H. Smith.
C.S. ... ... ... Rev. C. Soames.
J.S. ... ... ... Rev. J. Sowerby.
H.C.S. ... ... ... H. C. Spry.
F.S. ... ... ... F. Storr, Esq.
J.S.T. ... ... ... Rev. J. S. Thomas.

F.E.T. ... ... ... F. E. Thompson, Esq.
C.E.T. ... ... ... Rev. C. E. Thorpe.
A.J.T. ... ... ... A. J. Tisdall.
R.L.T. ... ... ... R. L. Tisdall.
E.J.T. ... ... ... E. J. Turner, Esq.
J.V. ... ... ... Mr. J. Velvin.
H.J.V. ... ... ... H. J. Verrall.
C.R.W. ... ... ... C. R. Waldron.
D.W. ... ... ... D. Walker.
O.F.W. ... ... ... O. F. Williams.
A.P.W. ... ... ... A. P. Wood.
H.J.S.W.... ... ... H. J. S. Wood.
O.E.W. ... ... ... O. E. Woodhouse.
G.W. ... ... ... G. Wootten.

**Clematis**
vitalba .... . not in bud, June 22
**Thalictrum**
flavum ..... June 13, J.S.
**Anemone**
nemorosa ... Feb. 27, F.E.T.
*apennina ... about Mar. 28
*sylvestris... May 10
*hepatica ... Jan. 6, J.G.B.
**Adonis**
autumnalis Mar. 9, T.A.P.
**Myosurus**
minimus .. May 1, J.S.
**Ranunculus**
trichophyllus full fl. May 10, F.S.
heterophyllus April 13, C.E.T.
peltatus ..... full April 24, J.S.
circinatus ... by May 27, T.A.P.
hederaceus .. full fl. May 1, J.S.
sceleratus ... (Devizes), Apr. 29, J.S. and F.E.T.
flammula ... June 10, J.S.
ficaria..... .. Jan. 30, H.E.B.
auricomus ... March 8, G.C.M.
acris ..... April 18, J.S.
*W* repens..... Feb. 27, J.S.
bulbosus..... March 30, F.E.T.
arvensis ..... May 1, J.S.; Apr. 29, (Devizes), F.E.T.
parviflorus ... April 27, F.E.T.
**Caltha**
palustris ... March 5, H.E.S.
**Trollius**
*Europæus May 7
**Eranthis**
*hyemalis ... Jan. 11, T.B.
**Helleborus**
viridis ..... Feb. 24, H.S.S.
**Aquilegia**
vulgaris ... *April 28; May 12, H.J.V.
**Aconitum**
*napellus ... April 27
**Nuphar**
*luteum..... May 24, J.H.G.
**Berberis**
vulgaris..... May 9, J.S.
*fascicularis Feb. 7, H.E.B.
**Papaver**
Argemone ... May 15, H.J.V.
rhœas..... May 12, J.S.
Dubium..... May 25, T.A.P.

Lecoqii ..... May 27, T.A.P.
Meconopsis
*cambrica ... by May 25
Chelidonium
majus ..... Ap. 27, T.A.P.; May 2, G.E.M.
Corydalis
*solida ..... March 9
Fumaria
*W* officinalis Feb. 16, F.E.T.
*formosa ... April 19
Nasturtium
officinale ... May 21, J.H.G.
palustre ..... May 7, J.S.
Barbarea
vulgaris ..... April 20, T.A.P.
Arabis
hirsuta ..... May 5, C.E.T.
Cardamine
sylvatica ... full April 29, T.A.P.
hirsuta ..... full Feb. 13, J.S.
pratensis ... March 25, C.S.
Sisymbrium
officinale ... April 13, J.S.
thalianum ... Feb. 26, J.S.
Alliaria
officinalis ... April 12, F.E.T.
Brassica
oleracea ..... April 11, T.A.P.
campestris... April 18, J.S.
napus ..... April 21, D.A.C.
Rapa ..... April 14, G.W.D.L.
Lunaria
*biennis..... full April 25, J.S.
Sinapis
*W* arvensis... Feb. 16, F.E.T.
*W* alba ..... full May 12, T.A.P.
nigra ..... (Devizes) Apr. 29, J.S.
Alyssum
calycinum ... by May 21, J.S.
Aubrietia
* by Feb. 13
Draba
verna ..... Feb. 26, J.S.
Armoracia
rusticana ... April 29, T.A.P.
Lepidium
campestre ... bud April 15, F.E.T.
*W* Capsella
bursa-pastoris Feb. 13, F.E.T.
Isatis
*tinctoria ... by May 10
Raphanus
Raphanistrum by May 27, H.J.V.
Reseda
lutea ..... May 27 (Highclere) F.G.; May 29, J.S.
Helianthemum
vulgare ..... May 16, F.S.
Viola
odorata ..... Jan. 17, J.V.
hirta ..... full Mar. 12, J.S.
Reichenbachiana ... March 4, J.S.; Apr. 20, J.S.
Riviniana ... Feb. 20; March 6, F.E.T.
canina ..... May 6, C.A.S.
tricolor ..... April 23, J.S.
(var)arvensis April 8, F.J.H.J.
*cornuta ... April 26
Polygala
vulgaris ..... April 25, C.R.D.
Dianthus
*caesius ..... May 29
Silene
inflata ..... May 27, O.E.W.; E.P.

Lychnis
flos-cuculi ... May 7, J.S.
vespertina ... May 1, J.S.
*W* diurna ... Feb. 21, J.B.O.; April 20, T.A.P.
Githago..... May 15, F.S.
Sagina
procumbens full, May 27, G.W.D.L.
Arenaria
trinervis ... April 20, F.E.T.
serpyllifolia May 9, J.S.
leptoclados... full May 23, F.E.T.
Stellaria
*W* media..... All the year
Holostea ... Feb. 27, F.E.T.; Mar. 25, J.S.
graminea ... May 27 (Highclere), F. G.; June 2, (Oare) F.S.; June 10, F.E.T.
uliginosa ... by May 27, T.A.P.
Cerastium.....
glomeratum March 7, F.E.T.
*W* triviale ... April 11, F.E.T.
*arvense ... May 11
Mœnchia
erecta..... May 21 (over) J.S.
Malva
moschata ... bud June 10, J.S.
sylvestris ... June 6, J.S.
rotundifolia.. May 1, T.A.P.
Tilia
parvifolia ... Young leaves, Mar. 25, J.W.D.; ditto April 12, W.M.
Acer
campestre ... Ap. 22, F.E.T.
Pseudo-platanus ..... April 29, (Dovizos) F.E.T.; May 7, J.S.
Æsculus
Hippocastanum ..... buds bursting, March 25, R.H.B.; leaf Ap.12; fl. Ap. 26, F.E.T.
Geranium
Phæum .....*May 10; May 15, J.S.
* sylvaticum May 11.
pratense ... May 30, J.S.
*sanguineum June 2.
lancastriense May 23.
dissectum ... May 11, F.E.T.
columbinum May 15, F.S.
rotundifolium ..... by May 10, T.A.P.
molle..... Ap. 20, F.E.T.
lucidum..... Ap. 26, C.E.T.; May 6, A. de B.H.
Robertianum Ap. 27, F.E.T.
* macrorhizon..... Ap. 10
Erodium
cicutarium June 5, J.S.
Linum
Catharticum May 22, F.E.T.
Oxalis
acetosella ... Ap. 20, T.A.P.
Euonymus
Europæus ... bud Mar. 16, H.R.A.; May 13, E.J.T.
Staphylea
* pinnata ... April 25.
Rhamnus
catharticus bud May 27, O.F.W.; fl. June 13, F.S.
Ulex
*W* Europæus all the year.
Genista
tinctoria ... May 27, (Highclere) F.G.

Sarothamnus
scoparius ... March 23, J.S.
Medicago .....
lupulina..... April 19, F.E.T.
Trifolium
pratense ... Ap. 24, J.S.
*incarnatum May 13, F.S.
repens ..... May 5, F.S.
procumbens by May 27, T.A.P.
minus..... May 6, F.E.T.
Lotus
corniculatus May 1, F.E.T.
major ..... bud June 16, T.A.P.
Anthyllis
vulneraria ... May 11, F.S.
Vicia
cracca ..... bud June 16, J.S.
hirsuta ..... May 12, J.S.
tetrasperma May 7, J.S.
sylvatica ... bud June 10, T.A.P.
sepium ..... April 18, J.S.
sativa..... May 7, J.S.
* faba ..... May 1, F.E.T.
Lathyrus
pratensis ... June 10, W.M.
macrorhizus Ap. 8, J.S.; Ap. 29, E.G.
Ornithopus
perpusillus May 27, (Highclere) F.G.
Hippocrepis
comosa ..... May 17, H.J.V.
Onobrychis
sativa..... bud April 23, J.S.; May 15, F.S.
Cytisus
*Laburnum Ap. 30, G.W.D.L.
Prunus
spinosa ..... Feb. 20, F.E.T.; leaf March 7, C.R.D.
insititia ..... Feb. 18, (Pewsey) S.B.D.; Feb. 27, D.E.L.
domestica ... Ap. 10, J.S.
Avium ..... Ap. 12, G.W.D.L.
*Padus ..... Ap. 27 (Devizes) J.S.
cerasus ..... Ap. 10, B.J.G. & F.G.
Spiræa
ulmaria ..... June 13, J.S.
Sanguisorba
officinalis ... Ap. 20, F.E.T.
Poterium
Sanguisorba Ap. 27, J.S.
Alchemilla
vulgaris..... March 11, C.A.S.
arvensis..... by March 12, J.S.
Sibbaldia
*procumbens full fl. May 10.
Potentilla
anserina..... May 12, T.A.P.
Tormentilla May 5, F.S.
fragariastrum ..... Jan. 18, H.E.B.
Fragaria
vesca .....*Jan. 13, J.V.; Feb. 23, J.S.
Rubus
Idæus.....*May 11; May 22, F.E.T.
cæsius ..... May 18, J.S.
fruticosus ... May 22, J.S.
Geum
*W*urbanum Feb. 7, J.S.
intermedium May 15, J.S.
rivale .....*Ap. 11; Ap, 26, F.E.T.
Rosa
canina ..... bud May 6, C.E.T.; fl. May 23, G.E.Me.
arvensis..... June 13, F.S.; June 20, A.P.W. and E.A.F.

Cratægus
oxyacantha leaf March 7, H.T.K. March 25, W.F.; fl. Ap. 29 (Devizes) J.S.; Ap. 30 S.C.V.F.
Pyrus
malus ..... April 26, F.E.T.
*aucuparia May 8, F.S.
Aria ..... by May 15, F.S.
*Japonica ... Feb. 9, H.E.B.
Amygdalus
*communis Feb. 10, H.E.B.
* Apricot Feb. 6, H.E.B.
* Apple ... Ap. 27, T.B.
* Peach ... Feb. 25, T.B.
* Damson Feb. 5, T.B.
* Plum ... March 19, J.W.D.
* Pear ... March 19, J.W.D.
* Medlar May 23, J.H.G.
Epilobium
montanum June 8, T.A.P.
Montia
fontana ..... May 15, J.S.
Bryonia
dioica..... May 22, F.E.T.
Spergula
arvensis ... May 1, J.S.
Scleranthus
annuus ..... May 15, H.J.V.
Sedum .....
*Rhodiola ... by May 10
album ..... bud June 16, F.S.
acre ..... June 11, F.S.; June 20, E.S.P. & R.L.T.
Ribes
grossularia March 9, T.A.P.
rubrum ..... Ap. 8, F.E.T.; *Ap. 5, T.B.
nigrum ..... over May 27, T.A.P.
* sanguineum ... Jan. 28, J.V.; Feb. 24, T.A.P.
*aureum ... April 13, T.A.P.
Saxifraga
*umbrosa ... Ap. 30, M.B.
cæspitosa ... May 15.
*Crassifolia Feb. 13.
*Kamschatica June 8.
tridactylites Feb. 28, J.S.
granulata ... April 20, J.S.
Philadelphus
*Coronarius May 16, J.W.D.
Sanicula
Europæa ... Ap. 29, F.J.H.J.; (full) May 9, F.S.
Helosciadium
inundatum June 10, F.E.T.
Ægopodium
podagraria... bud May 12, F.S.; May 27, T.A.P.
Bunium
flexuosum ... May 1, J.S.
Pimpinella
saxifraga ... April 6, F.E.T.
Œnanthe
crocata ..... just out May 30, J.S.
Æthusa
cynapium ... bud April 21, F.E.T.
Haloscias
*scoticum ... by June 16.
Silaus
pratensis ... June 6, J.S.
Meum
*Athamanticum..... May 13.
Angelica
sylvestris ... June 10, J.S.
Pastinaca
*W* sativa ... Feb. 16, F.E.T; May 12, F.E.T.

Heracleum
sphondylium April 20, F.E.T.
Daucus
carota ..... May 12, F.E.T.
Torilis
nodosa .... . full bud May 29, J.S.
Scandix
*W* pecten ... all the year.
Anthriscus
sylvestris ... Feb. 14, J.B.F.; Feb. 24, F.S.; Ap. 3, J.S.
Chærophyllum
temulum ... May 22 (Hungerford) F. S.; May 27, A.P.H.
Conium
maculatum June 9 (Calne), F.S.
Adoxa
moschatellina ..... Feb. 20, E. im T.; March 5, J.S.
Cornus
sanguinea ... May 31, J.S.
*mascula ... Feb. 13.
Sambucus
nigra ..... May 4, J.S.; May 12, J.S.; May 20.
Viburnum
latana ..... Ap. 19, F.E.T.
opulus ..... *May 14, J.S.; May 27, J.F.L.; (fertile) June 7, F.E.T.
*laurustinus Feb. 13, T.B.
Lonicera
*caprifolium Ap. 29 (Devizes), J.S.; May 1, J.S.
Periclymenum ... June 2.
Symphoricarpos
*racemosus by June 19.
Sherardia
arvensis..... Ap. 20, F.E.T.
Asperula
cynanchica not observed.
odorata ..... *Ap. 19; Ap. 26, F.E.T.
Galium
cruciatum ... April 19, J.S.
Aparine..... April 30, J.S.
Mollugo..... June 2, J.S.; June 13, J.S.
verum ..... coloured bud June 20, J.H.G.
saxatile ..... May 27 (Highclere), F.G.; June 10, F.S.
uliginosum June 2 (Oare), F.S.
(var) Witheringii ..... June 19, F.E.T.
Centranthus
*ruber ..... by June 6.
Valeriana
officinalis ... June 9 (Calne), F.S.; bud June 10.
dioica..... April 30, J.S.
Valerianella
olitoria ..... April 22, T.A.P.
Dipsacus
sylvestris ... bud June 15, J.B.G.
Knautia
arvensis..... May 22, J.S.; May 27, G.W., T.N.H.S.
Petasites
vulgaris..... Feb. 25, F.S.; March 3, H.M.
Tussilago
Farfara ..... Feb. 14, J.B.F.
Bellis
*W* perennis all the year.
Achillea
* tomentosa ... May 18.
*W* Millefolium still out Feb. 13, J.S.; new fl. June 4, J.S.

Anthemis
arvensis..... nearly out May 18, J.S.; May 23, F.S. May 27, O.F.W.
nobilis ..... June 10, T.A.P.
Matricaria
Parthenium About June 16
*W* inodora... Feb. 21, J.S.
Chrysanthemum
Leucanthemum ..... bud Ap. 24, J.S.; May 22, J.S.
segetum..... May 22 (Hungerford) F.S.; by May 27 (Pewsey), H.J.V.
Doronicum
* Pardalianches ..... Ap. 22.
Senecio
*W* vulgaris... all the year.
Jacobæa ... May 22, J.S.
aquaticus ... bud May 27, J.F.L.; not in fl. June 16.
Serratula
tinctoria ... bud June 10, T.A.P.
Centaurea
nigra ..... June 10, J.S.
cyanus ..... May 27, (Highclere), F.G.
scabiosa..... June 9, (Calne) F.S.: June 10, T.A.P.
*montana ... May 13, F.S.
Carduus
nutans ..... April 27, F.E.T.
crispus ..... May 2, H.G.; May 13, F.S.
lanceolatus bud, June 20.
arvensis ... not in flower, June 20.
palustris ... bud May 20, H.J.V.; May 27, G.W.D.L.
acaulis ..... not in fl. June 20.
Silybum
marianum ... bud May 23.
Lapsana
communis ... June 4, J.S.
Hypochœris
radicata..... May 7, J.S.
Apargia
hispida ..... May 17, H.J.V.
Tragopogon
minor ..... May 11, J.S.
Leontodon
*W* taraxacum all the year.
Sonchus
*W* oleraceus March 9, T.A.P.; May 27, H.C.S.
*W* asper ..... March 7, J.S.: April 13, J.S.
Crepis
*W* virens..... still out Feb. 21; fresh fl. May 5, F.E.T. and J.S.
Hieracium
pilosella..... May 6, F.E.T.
*aurantiacum May 17
Campanula
glomerata... *May 10; May 23, F.S.
Specularia
hybrida ... by May 22, F.E.T.
Ilex
aquifolium... nearly out Ap. 2, F.E.T.; Ap. 29, (Devizes), J. S.; fl. May 12, F.E.T.
Ligustrum
vulgare ..... May 27, (Highclere), F. G.; June 9, (Calne), F.S.; bud June 10, (Marlborough.
Fraxinus
excelsior ... March 5, J.S.

Syringa
*vulgaris ... Ap. 23, F.E.T.
*Persica..... Ap. 23, T.A.P.
Vinca
minor ..... Feb. 3, H.E.B.
major ..... Mar. 17, J.S.
Gentiana
amarella ... June 8, (a single specimen).
Menyanthes
trifoliata ... *Ap. 19, J.H.G.; by Ap. 22, J.S.
Convolvulus
arvensis ... June 12, J.S.
Cynoglossum
officinale ... cold buds May 16, G.W.; May 19, C.E.T.
Borago
*officinalis ... about Ap. 20
Lycopsis
arvensis ... May 1, J.S.
Symphytum
officinale ... Ap. 15, C.E.T.
Pulmonaria
officinalis ... *Feb. 13, T.A.P.
Lithospermum
officinale ... May 18, J.S.
arvense ..... Ap. 22, F.S.
Myosotis
palustris ... May 27, J.S.
arvensis..... Ap. 26, J.S.
collina ..... Ap. 20, F.E.T.
versicolor ... May 1, J.S.
Solanum
Dulcamara... June 5, J.S.
Atropa
* Belladonna May 23
Hyoscyamus
niger ..... by June 17, F.S.
Lycium
*barbarum ... May 12, F.E.T.
Orobanche
minor..... June 5, J.S.
Lathræa
squamaria... Ap. 11, B.J.G. & F.G.
Verbascum
Thapsus ... bud June 20, H.S.D.
nigrum ..... bud June 13, J.S.
Antirrhinum
*majus..... May 23
Linaria
cymbalaria... Ap. 17, F.E.T.
Scrophularia
nodosa ..... June 2, J.S.
aquatica ... bud June 16
Melampyrum
pratense ... May 27, T.A.P.
Pedicularis
sylvatica ... Ap. 30, H.E.B.
palustris ... June 10, J.S.
Rhinanthus
Crista-galli.. May 11, W.D.F., and A.C.H.
Euphrasia
officinalis ... May 27, C.E.T.
odontites ... June 13, F.S.
Veronica
Anagallis ... May 27, T.A.P.
Beccabunga May 19, J.S.
Chamædrys Ap. 12, C.E.T.
officinalis ... June 10, J.S.
serpyllifolia Ap. 30, J.S.
*W* arvensis ... all the year
*W* agrestis ... ditto
*W* polita ..... ditto
*W* Buxbaumii.. ditto
hederifolia... Feb. 16, F.E.T.
Thymus
serpyllum ... June 5, J.S.

Prunella
vulgaris..... bud June 16.
Nepeta
Glechoma ... March 3, R.A.
Lamium
*W* amplexicaule all the year
*W* purpureum all the year
*W* album ..... all the year
Galeobdolon April 23, F.E.T.; G E.Mc.
Stachys
Betonica ... bud June 16, T.A.P.
sylvatica ... June 10, J.S.
Ballota
fœtida ..... bud May 1: bud June 10.
Ajuga
reptans ..... bud March 20, P.L.H. April 26, J.S.; white var. May 16 H.T.K.; May 27, T.N.H.S.
Primula
vulgaris..... Jan. 17, J.V. coloured var. Mch 20, O.E.W.
caulescens... (full) April 11, F.H.S.
veris ..... Feb. 27, D.E.L.; March 20, E.L.H.
Lysimachia
nemorum May 11, J.S.
Anagallis
arvensis..... by May 1, J.S.
Plantago
lanceolata ... Ap. 11, J.S.
media..... May 7, J.S.
major..... May 27, J.S.
Chenopodium
Bonus-Henricus ..... May 9, J.S.
Rumex
conglomeratus ..... June 10, T.A.P.
obtusifolius June 8, T.A.P.
crispus ..... May 12, C.E.T.
acetosa ..... Ap. 27, J.S.
acetosella ... May 1, J.S.
Polygonum
Bistorta.....*full bud May 10, C.St J.B.
amphibium bud May 27, J.S.
Daphne
*mezereum Jan 2, H.E.B.
Laureola ... Feb. 16, J.S.
Buxus
sempervirens Feb. 16, J.S.
Euphorbia.....
*W* Helioscopia all the year
amygdaloides March 4, J.S.
*W* Peplus ..... all the year
exigua ..... May 17, J.S.
Mercurialis
perennis..... male Feb. 13, H.M.H. fertile Feb. 15, T.A.P.
Callitriche
verna..... May 7, J.S.
Urtica
urens..... Feb. 13, F.E.T.
dioica ..... May 20, T.A.P.
Ulmus
suberosa ... March 4, J.S.
montana ... Feb. 5, J.S.
Salix
caprea ..... Feb. 16.
Populus
nigra ..... (full) March 7, J.S.
Betula
glutinosa ... Ap. 24, F.E.T.

Fagus
sylvatica ... buds bursting Mar. 22, J.A.L.; one tree green, Ap. 14, T.B.; fl. Ap. 24, J.S.

Castanea
vulgaris..... bud May 27, E.P.; bud June 5, J.S.

Quercus
Robur ..... leaf Ap. 20, C.A.S.: fl. Ap. 20, J.S.

Corylus
avellana..... fertile fl. Jan. 17, J.V.; in fl. Ap. 20.

Juglans
regia ..... May 13, T.A.P.

Carpinus
Betulus ..... March 16, T.A.P.

Taxus
baccata ..... Feb. 13, J.S.

Juniperus
communis ... Ap. 20, T A.P.; May 6, F.E.T.

Pinus
sylvestris ... May 2, C.R.C.

Larix
Europæa ... Feb. 18, G.W.D.L.

Paris
quadrifolia by May 1, F.G.

Tamus
communis ... May 27, H.J.V.; O.F.W.; T.N.H.S.

Orchis
morio..... Ap. 20, F.E.T. May 1
mascula..... Ap. 11, J.S.
ustulata..... May 17, J.S.
maculata ... May 22 (Hungerford) F.S.; May 27, G.W.D.L.
latifolia ..... June 10, J.S.
incarnata ... May 9, J.S.
pyramidalis June 10, J.S.

Gymnadenia
conopsea ... bud May 27, J.S.; June 5, F.E.T.

Habenaria
viridis ..... about May 22, C.S.
chlorantha May 23, F.E.T.

Listera
ovata ..... May 5, F.S.

Neottia
nidus-avis ... May 27 (Higholere), F.G.; not observed about Marl.

Epipactis
latifolia..... bud June 20.

Cephalanthera
grandiflora June 10 (Oare), F.S.

Sisyrinchium
* anceps ... May 29.

Iris
Pseudacorus full bud Ap. 18, J.S; fl. May 15, H.R.A.
fœtidissimus bud June 22.

Crocus
*vernus ..... June 14, J.V.

Narcissus
pseudo-narcissus.....*Feb. 10, J.V.; full fl. Feb. 20, E H.D.

Leucojum
*Æstivum April 26.

Galanthus
nivalis ..... Jan. 11, T.B.; Jan. 12, J.V.

Convallaria
*majalis..... April 28, M.B.

Polygonatum
multiflorum April 29 (Devizes), F.E.T.; (Bedwyn) F.J.H.J.; May 1 (Ramsbury) F.G.; May 12, F.E.T.

Ruscus
aculeatus ... bud March 16, T.A.P; fl. by Ap.25, F.S.
Tulipa
*sylvestris... April 6.
Van Thol Tulip ..... March 5, T.B.
Fritillaria
*meleagris About April 10.
*Imperialis March 9.
Ornithogalum
umbellatum *by May 10; May 27, C.E.T.
Scilla
*bifolia ..... by Feb. 13.
*sibirica ... by Feb. 13.
*amœna..... full fl. Feb. 13.
Allium
vineale ..... bud June 22.
ursinum..... *May 11; full fl. May 22, F.E.T.
Endymion
nutans ..... bud Mar. 25, H.R.A.; April 9, H.J.S.W. and C.R.D.
(white var.) April 29, E.G.
Garden hyacinth ..... Feb. 13
Muscari
*racemosum March 9.
Erythronium
*Dens-canis March 9, J.S.T.
Anthericum
*liliastrum May 14.
Juncus
effusus ..... bud June 16.
glaucus ..... bud June 2.
acutiflorus... April — J.S.
bufonius ... bud June 10, W. M.
Luzula
pilosa ... March 25, J.S.
campestris April 2, F.E.T.
Alisma
plantago ... June19(Bedwyn)F.S.
Arum
maculatum Apr. 18, E.P. and A.P.W.
Orontium
*aquaticum April 19, J.H.G.
Potamogeton
crispus ..... May 21, J.S.
Eleocharis
palustris ... Ap.29(Devizes),J.S.; May 27, T.A.P.
Scirpus
lacustris .. May 20, W.S.O.
Carex
pulicaris ... seed June 16
divulsa ..... May 5, F.E.T.
vulpina ..... Ap. 22, J.S.
paniculata .. by May 20, J.S.
pendula... .. April 29, (Devizes), F.E.T.
præcox ..... April 20, J.S.
pilulifera ... April 29, T.A.P.
glauca ..... April 20, T.A.P.
sylvatica ... April 29, T.A.P.
hirta ..... May 27, J.F.L.
paludosa ... April 18 J.S.
riparia ..... April 8, J.S.
Phalaris
arundinacea June 10, T.A.P.
Anthoxanthum
odoratum ... April 20, T.A.P.
Phleum
pratense ... June 10, T.A.P.
Alopecurus
pratensis ... March 25, F.E.T.
geniculatus (full) June 8, T.A.P.
agrestis ..... Ap. 20, T.A.P.
Milium
effusum ..... May 1, T.A.P.

Holcus
lanatus ..... May 15, H.J.V.
mollis..... June 10, T.A.P.
Aira
cæspitosa ... June 10, T.A.P.
flexuosa... .. May 27, T.A.P.
caryophyllea May 21, J.S.
Trisetum
flavescens ... June 8, T.A.P.
Avena
pratensis ... May 20, J.S.
pubescens... May 21, J.S.
Arrhenatherum
avenaceum May 27, T.A.P.
Koeleria
cristata ..... May 25, J.S.
Melica
uniflora ..... Ap 30, J.S.
Poa
*W* annua ... all the year
trivialis ..... May 12, T.A.P.
pratensis ... April 19, T.A.P.
Glyceria
fluitans ..... May 15, H.J.V.
plicata ..... June 10, J.S.
aquatica ... June 19, F.E.T.
Briza
media..... May 22, J.S.
Catabrosa
aquatica..... June 9 (Calne), F.S.
Cynosurus
cristatus ... May 27, T.N.H.S.
Dactylis
glomerata ... April 29, T.A.P.
Festuca
sciuroides ... May 27, T.A.P.
ovina ..... May 21, J.S.
rubra ..... May 7, J.S.
arundinacea June 8, T.A.P.
Bromus
erectus ..... Ap. 27, J.S.
asper ..... May 21, T.A.P.
sterilis ..... May 7, J.S.
Serrafalcus
racemosus... May 1, J.S.
mollis..... April 29, T.A.P.
Lolium
perenne..... May 1, T.A.P.
Rye ..... May 1, J.S.
Barley ... June 8, T.A.P.
Wheat ... June 14, G.W.D.L.
Equisetum
arvense ..... fertile Ap. 17, F.E.T.; barren April 27, C.R.W.
limosum ... April 15, C.E.T.
palustre..... April 6, J.S.
Pteris
aquilina..... 9 inches high Ap. 25, C.A.S.; 1 ft. May 9, E.A.F.; 3 feet May 16, E.A.F. and C R.D.
Botrychium
Lunaria..... May 5, C.A.S.
Ophioglossum
vulgatum ... May 27, T.A.P.
Morchella
esculenta ... April 11, R.M.B.G.
semilibera... April 25, C.T.R.
Spumaria
mucilago May 21, A.J.T.

## NEW SPECIES.

| | |
|---|---|
| Ranunculus trichophyllus... | Near Pewsey, F.S.; Bedwyn, J.S. |
| Ranunculus Sceleratus ... | Devizes, J.S. & F.E.T. |
| Sinapis nigra ... ... ... | Devizes, J.S. & F.E.T. |
| Alyssum calycinum ... .. | Field near the Grand Stand on Marlborough Common, J.S. |
| Arenaria leptoclados... ... | Marlborough, F.E.T. |
| Mœnchia erecta... ... ... | Near Rockley Farm, J.S. |
| Lotus major ... ... ... | Axford, T.A.P. |
| [Ornithopus perpusillus .. | Higholere, F.G.] |
| Galium uliginosum ... ... | Oare, F.S.; Bedwyn, J.S. |
| Galium uliginosum— (var. Witheringii) ... ... | Axford, J.S. |
| Silaus pratensis... ... ... | Fyfield, J.S.; Polton, F.S. |
| Specularia hybrida ... ... | Martinsell, F.E.T.: Bedwyn, J.S. |
| Typha latifolia ... ... ... | Axford, T.A.P.; near Savernake, J.S. |
| Juncus acutiflorus ... ... | Axford, T.A.P. |
| Carex paniculata ... ... | Axford, J.S. |
| Aira flexuosa ... ... ... | Martinsell, T.A.P. |
| Catabrosa Aquatica ... ... | Calne, F.S. |

## NEW LOCALITIES.

| | |
|---|---|
| Ranunculus parviflorus ... | Devizes, J.S. & F.E.T. |
| Papaver argemone ... ... | Pewsey, J.S. |
| [Corydalis solida ... ... | Mildenhall, H.J.V.] |
| Reseda lutea ... ... ... | Mildenhall, J.S.; Higholere, F.G. |
| Viola canina ... ... ... | Savernake Forest, C.A.S. |
| Stellaria uliginosa ... ... | Marlborough water meadows, T.A.P. |
| Geranium columbinum ... | Rabley, F.S.; Mildenhall, W.M. |
| Geranium lucidum ... ... | Fyfield, C.E.T. |
| Erodium cicutarium ... ... | Near Savernake, J.S. |
| Pyrus Aria... ... .. ... | Mildenhall, F.S. |
| Montia fontana ... ... ... | Martinsell, J.S. |
| Scleranthus annuus .. ... | Martinsell, J.S.; Mildenhall, T.A.P. |
| Dipsacus sylvestris ... ... | Near Axford, J.B.G. |
| Anthemis arvensis ... ... | Mildenhall, F.S.; Savernake, T.A.P. |
| Chrysanthemum segetum | Pewsey, T.A.P. |
| Lycopsis arvensis ... ... | Pewsey, J.S. |
| Litho-permum officinale ... | Rockley, T.A.P. |
| Polygonum Bistorta ... ... | Bedwyn, T.A.P.; Mildenhall, J.B.G. |
| Allium vineale (?) ... ... | Mildenhall, T.A.P. |

| | |
|---|---|
| Allium ursinum ... ... ... | Mildenhall, C.S. |
| Ornithogalum umbellatum | Axford, C.E.T.; Martinsell, T.A.P. |
| Cephalanthera grandiflora | Oare, F.S. |
| Juncus bufonius .. ... ... | Polton, W.M. |
| Carex pendula ... ... ... | Devizes, J.S. and F.E.T.; Pewsey, F.S. |
| Aria caryophyllea ... ... | Rockley, J.S. |
| Ceterach officinarum... ... | Devizes, J.S. and F.E.T. |
| Ophioglossum vulgatum ... | Canal near Savernake, T.A.P. |

## ORNITHOLOGY.

THE following are the names of those whose initials occur in the following list :—

| | |
|---|---|
| R.A. ... ... ... | R. Atkinson |
| D.J.B. ... ... ... | D. J. Blyth |
| L.C. ... ... ... | L. Calley |
| G.T.P.C. ... ... ... | G. T. P. Cambridge |
| J.H.R.C. ... ... ... | J. H. R. Clark |
| D.C. ... ... ... | D. Coles |
| C.E.D. ... ... ... | C. E. Down |
| H.C.E. ... ... ... | H. C. Eyres |
| A.B.F. ... ... ... | A. B. Fenton |
| S.E.V.F.... ... ... | S. E. V. Filleul |
| J.B.F. ... ... ... | J. B. Fuller |
| J.T.F. ... ... ... | J. T. Fullerton |
| W.G. ... ... ... | W. Gay |
| T.G.G. ... ... ... | T. G. Gibbons |
| R.M.B.G. ... ... | R. M. B. Glasse |
| B.J.G. .. ... ... | B. J. Guillemard |
| E.L.H. ... ... ... | E. L. Hesketh |
| H.M.H. ... ... ... | H. M. Hilton |
| H.M. ... ... ... | H. Manders |
| J.C.M. ... ... ... | J. C. Mansell |
| J.B.O. ... ... ... | J. B. Oakeley |

T.C.O. ... ... ... T. C. Owen
R.P. ... ... ... R. Phayre
S.A.R. ... ... ... S. A. Rogers
F.H.S. ... ... ... F. H. Shelley
C.A.S. ... ... ... C. A. Sladen
S.S. ... ... ... S. Smallpiece
W.J.S. ... ... ... W. J. Smythies
H.C.S. ... ... ... H. C. Spry
H.P.St.J. ... ... H. P. St. John
T.T. ... ... ... T. Tilleard
G.M.T. ... ... ... G. M. Tuke
F.F.W. ... ... ... F. F. White

| | | |
|---|---|---|
| Falco tinnunculus | Kestrel Hawk | egg May 11th, T. T. |
| Accipiter nisus | Sparrow Hawk | egg April 29th, J. B. F.; E. L. H. |
| Otus vulgaris | Long-eared Owl | egg March 20th, J. B. O.; S. A. R. |
| Strix flammea | Barn Owl | egg May 8th, R. M. B. G.; R.A. |
| Syrnium stridula | Tawny Owl | young birds May 10th, T. W. Harvey |
| Lanius collurio | Butcher bird | egg May 27th. |
| Muscicapa grisecla | Spotted Flycatcher | egg May 27th, J. B. F.; E. L. H. |
| Turdus viscivorus | Missel Thrush | egg March 14th, F. H. S. |
| Turdus musicus | Song Thrush | egg March 26th, S. A. R.; D.J. B. |
| Turdus merula | Blackbird | egg April 7th, J. H.R. C.; J.B.O.; young birds April 6th, T. T. |
| Accentor modularis | Hedge Sparrow | egg April 16th, A. B. F.; J. B. O. |
| Erythaca rubecula | Redbreast | egg April 10th, T. G. G. |
| Phœnicura ruticilla | Redstart | egg April 29th, G. T. P. C. |
| Saxicola rubicola | Stone-chat | egg April 25th, S. A. R.; F. F. W. |
| Saxicola œnanthe | Wheat-ear | seen April 8th, J.B.O. H.M.H.; egg May 9th, B. J. G. |
| Saxicola rubetra | Whin-chat | seen April 24th, T. T. |
| Salicaria phragmitis | Sedge Warbler | egg May 23rd, G. T.P. G.; S.E.V.F. |
| Sylvia arundinacea | Reed Warbler | egg May 27th, G. T.P.C.; S.E.V.F. |
| Philomela luscinia | Nightingale | egg May 30th, Mr. Armstrong. |
| Sylvia atricapilla | Black-cap | egg May 8th, H. C. S.; R. P. |
| Sylvia hortensis | Garden Warbler | egg May 15th, J. C. M. |
| Sylvia cinerea | Whitethroat | egg May 16th, T. T. |
| Sylvia curruca | Lesser Whitethroat | egg May 14th, J. B. F.; B. J. G. |
| Sylvia sibillatrix | Wood Warbler | egg May 21st, S. E. V. F. |
| Sylvia trochilus | Willow Warbler | seen April 11th, T.T.; egg May 12th, H. C. E. |

| | | |
|---|---|---|
| Sylvia rufa ... ... | Chiff-chaff ... | ... egg May 10th, J. B. O. |
| Regulus auricapillus | Gold-crest ... | ... egg May 12th, E. H. Currey. |
| Parus major ... ... | Greater Tit ... | ... egg April 26th, G. T. P. C. |
| Parus cæruleus... ... | Blue Tit... ... | ... egg April 24th, C. A. S. |
| Parus ater. . .. ... | Cole Tit... ... | ... egg May 1st, R. A.; S. E. V. F. |
| Parus caudatus... ... | Long-tailed Tit | ... egg April 20th, H. C. S.; R. P. |
| Motacilla Yarrellii ... | Pied Wagtail... | ... egg April 24th, T. T.; H. M. H. |
| Motacilla flava ... ... | Yellow Wagtail | ... seen April 24th, S. A. R. |
| Anthus arboreus ... | Tree Pipit ... | ... egg May 22nd, J. B. F.; J. B. O. |
| Anthus pratensis ... | Meadow Pipit | ... egg May 9th, C. E. D. |
| Alauda arvensis ... | Sky Lark ... | ... egg April 19th, T. T. |
| Alauda arborea.. ... | Wood Lark ... | ... egg May 21st, S. E. V. F. |
| Emberiza schœniclus | Black headed Bunting ... | ... egg May 9th, J. C. M. |
| Emberiza citrinella ... | Yellow Bunting | ... egg April 24th, C. E. D.; D. C. |
| Fringilla cœlebs ... | Chaffinch ... | .. egg April 24th, S. A. R.; S. S. |
| Fringilla carduelis ... | Goldfinch ... | ... eggMay10th,T.C.M.; E.Le.S.Dobreé. |
| Fringilla cannabina... | Linnet .. ... | ... egg April 25th, T. C.O.; H.P.St. J. |
| Coccothraustes chloris | Greenfinch ... | ... egg April 19th, T. T. |
| Passer domesticus ... | House Sparrow | ... egg April 24th, D. C.; C. E. D. |
| Pyrrhula vulgaris ... | Bullfinch ... | ... egg May 13th, T. T. |
| Sturnus vulgaris ... | Starling ... | ... egg April 19th, T. T. |
| Corvus frugilegus ... | Rook ... ... | ... egg March 12th, W. G. |
| Corvus monedula ... | Jackdaw ... | ... egg April 21st, T. T.; H. M. H. |
| Pica caudata ... ... | Magpie ... ... | ... egg April 22nd, T. T.; H. M. H. |
| Garrulus glandarius... | Jay... ... ... | ... egg April 20th, T. T.; J. B. O. |
| Picus viridis ... ... | Green Woopecker | egg May 10th R. M. B. G.; R. A. |
| Picus major ... ... | Great Spotted Woodpecker | ... Young birds taken in the forest. |
| Certhia familiaris ... | Tree creeper... | ... egg May 1st, H. C. E. |
| Troglodytes vulgaris | Wren ... ... | ... egg May 4th, J. T. F. |
| Sitta europæa ... ... | Nuthatch ... | ... egg May 11th, T. C.O. and G.T.P.C. |
| Cuculus canorus ... | Cuckoo ... ... | ... seen April 14th,R.M.B.G. egg May 13th, C. P. Nash. |
| Hirundo rustica ... | Swallow ... | ... seenApril8th, J.B.O.; eggMay29th J. B. O.; J. B. F. |
| Hirundo urbica... ... | Martin ... ... | ... seen April 11th, J. B. F.; E. L. H. |
| Hirundo riparia ... | Sand Martin ... | ... seen April 8th, J. B. O.; egg May 27th J. C. M.; R. S.Creaton. |
| Cypselus apus ... ... | Swift ... ... | ... seen April 24th, S.A.R.; egg June 15th, J. B. F.; E. L. H. |

| | | |
|---|---|---|
| Columba palumbus ... | Ring Dove ... ... | egg April 12th, C. A. S. |
| Columba œnas ... ... | Stock Dove ... ... | egg April 20th, T. T.; J. B. O. |
| Columba turtur ... | Turtle Dove ... ... | egg May 29th, H. P. St.J. |
| Œdicnemus crepitans | Stone Curlew ... | egg April 22nd, J. B. O. |
| Vanellus cristatus ... | Lapwing ... ... | egg April 12th, J. B. O. |
| Totanus hypoleucus... | Sandpiper ... ... | seen April 24th, J.B.O. |
| Gallinula chloropus ... | Moorhen ... ... | egg April 9th, H.M.; G.M.T. |
| Gallinula crex ... ... | Landrail ... ... | seen April 24th, F.F.W. |
| Podiceps minor... ... | Dabchick ... ... | egg April 7th, L.C.; W.J.S. |
| Anas boschas ... ... | Wild Duck ... ... | egg April 23rd, H.C.S.; R.P. |

## ARCHÆOLOGY.

This section has shown more life this Half-year than usual, as the meetings have been held regularly every fortnight, and have been fairly well attended. Three table cases have been purchased to hold our curiosities, and these are full. The chief donations are a set of Esquimaux implements by Mr. Sawyer, of Marlborough, an old Bible, by Mr. Cane, some Feejee curiosities by Mr. Bambridge, and some Abyssinian by G.E.Manisty. The Coin collection has also greatly increased, the chief donors being the Rev. C. Soames, of Mildenhall, Rev. T. A. Preston, and E. A. Furneaux. H.R.H. Prince Leopold has also presented two gold coins, probably ancient British.

TABLE CASE—No. I.

Flint Implements, presented by E. C. Scobell, Esq.

5 Angular Sling Stones
5 Rounded ,,
2 Flat ,,
5 Thumb flints
4 Elongated Thumb flints
A Knife and Scraper combined
Stone Axe-head
Axe-head and Hammer in one
4 Javelin Points
2 Leaf-shaped Arrow-heads

Barbed Arrow-head
2 Spear points
2 Knives
4 Knives of flint
5 Flint Saws
Common Scraper
Triangular „
Knife, saw, and scraper, combined
Arrow-tooth for agriculture
2 Flint Drills
Mealing Stone

TABLE CASE—No. II.

Esquimaux Implements, presented by Mr. Sawyer.

2 Walrus Tusks
Model of Harpoon, with loose Head
Spear head for fishing
Drill bow and string, for procuring fire
Specimen of work in Reindeer hair
Ivory imitation of a silver fork
Ornament, at one end a bear asleep, at the other a bear with a seal in its mouth
3 Labrets or lip ornaments, worn through holes cut in the lip or cheek
Pipe and knife, overlaid with the solder from the preserved meat tins.

TABLE CASE—No. III.

Bones of rat and sheep
Burnt Bone
Bone implements
Antler of red deer
Land-whelk
} from the house of a Pictish Chief in the Orkneys. Presented by J. B. Gilmore, Esq.

Chinese 7d. bank-note and visiting card; presented by C. B. Everard, Esq.
Chinese Soldier's badge of merit, presented by Mr. Chivers.
Mummy Cloth, presented by Sergeant Adams.
Cement from Stonehenge, presented by Mr. Baverstock.
Bone spear-head, Flint hammer-head, Roman tear-bottle, and Cinerarium, presented by J. W. Parrington.
Medal of the Spanish Academy.
Key of the original Marlborough Castle, presented by Mr. Wooldridge.

# COLLECTION OF COINS.

## ENGLISH.

Two gold coins, probably ancient British; presented by H.R.H. Prince Leopold.

Saxon penny of Marlborough, presented by Rev. W. H. Bull.

| | | |
|---|---|---|
| William I | Penny | |
| William II, Henry I, Stephen | unrepresented | |
| Henry II | Penny (first coinage) | |
| Eleanor | Penny | |
| Richard I | Penny (Aquitaine) | |
| John | Half-penny | |
| Henry III | Penny | Rev. C. Soames |
| | Penny (Irish coinage) | |
| Edward I | Penny | F. Storr, Esq. |
| Edward II | Penny | |
| | Half-penny | |
| Edward III | Groat | Mr. C. Brampton |
| | Half-groat | |
| Richard II | Penny | |
| Henry IV | Penny | G. G. Monck |
| Henry V | unrepresented | |
| Henry VI | Penny (York coinage) | |
| Edward IV, Edward V, Henry VII, Henry VIII | unrepresented | |
| Edward VI | Shilling | G. G. Monck |
| Mary | unrepresented | |
| Elizabeth | Two Shillings; | G. G. Monck, Rev. G. W. DeLisle |
| | Sixpence | E. C. Sewell |
| | Three-pence | |
| | Half-groat | |
| | Two penny pieces | |
| Mary, Queen of Scots | Plack | |
| James I | Half-groat | |
| | Penny | A. D. Nind |
| | Penny (Irish) | Rev. C. Soames |

| | | |
|---|---|---|
| Charles I | Half-groat | |
| | Penny | Rev. C. Soames |
| Commonwealth | Shilling | |
| | Half-groat | |
| | Penny | |
| | Half-penny | |
| Charles II | Groat | Rev. C. Soames |
| | Three-pence | Mrs. C. W. Tayler |
| | Half-groat | Mrs. C. W. Tayler |
| James II | Half-crown (gun money) | Rev. C. Soames |
| | Threepence | Rev. C. Soames |
| William & Mary | Groat | Mr. C. Perkins. |
| | Half-groat | |
| William III | Shilling | |
| | Sixpence | Rev. G. D. Hodgson |
| Anne | Shilling | G. C. Brown |
| George I | unrepresented | |
| George II | Shilling | H. Freeman |
| | Sixpence | G. C. Brown |
| | Penny | Mrs. C. W. Tayler |
| George III | Sixpence | |
| | Half-groat | Mrs. C. W. Tayler |
| George IV | Lion shilling | |
| William IV | Half-crown | |
| Victoria | Florin (recalled) | |
| | Half-groat | C. Irwin |
| | Three half-pence | C. Irwin |
| | Penny | C. Irwin |

ENGLISH COPPER.

| | | |
|---|---|---|
| Charles II | Scotch farthing | |
| | English farthing | |
| William & Mary | Half-penny | A. D. Nind |
| William III | Half-penny | Rev. C. Soames |
| George I | Farthing | |
| | Irish farthing | |
| | Irish half-penny | |
| George II | Penny | A. D. Nind |
| | Half-penny | |
| | Farthing | A. D. Nind |
| George III | Half-penny (1770) | Rev. G. D. Hodgson |

| | | |
|---|---|---|
| George III | Cartwheel twopenny piece, | H. S. Dickinson |
| | „ penny piece | G. A. W. Tate |
| | Penny 1806 | G. A. W. Tate |
| | Half-pennny 1806 | W. H. Churchill |
| | Farthing | W. H. Churchill |
| | Irish mite | |
| George IV | Half-penny | G. A. W. Tate |
| | Farthing | G. A. W. Tate |
| Victoria | Penny (1858) | |
| | Farthing | |
| | Mite | |

## ROMAN COINS:

Presented by Rev. C. Soames,

| | |
|---|---|
| Gallienus | Urbs Roma |
| Claudius | Constantinopolis |
| Divo Claudio | Nob. Cæsar |
| Postumus | Vot. X |
| Victorinus | Crispus |
| Tetricius | Nob. Cæs. Vot. V. |
| Carausius | Gloria Exercitus |
| Allectus | Constantius |
| Probus | Decentius |
| Licinius | Magnensius |
| Theodora and Helena | Constantius |
| Constantinus | Valens |
| Soli Invicto | Gloria Reipublicæ |
| Prætorian Gate | Maximus |
| Beata Tranquillitas | Constantius (from Egypt) |
| Const. Nob. Cæsar | |

| | | | |
|---|---|---|---|
| Heliogabalus | | presented by | Rev. T. A. Preston. |
| Antonius Pius | silver denarius | „ | J. C. Brown |
| Commodus | second bronze | „ | J. C. Brown |
| Faustina | „ | „ | J. C. Brown |
| Vespasian | „ | „ | W. G. Fellowes |

and others not yet arranged.

The collection also includes English Colonial coins, Tokens, as well as Foreign silver and copper coins.

W. D. FENNING.

# DONATIONS TO THE MUSEUM.

*Archæology.*—

Mummy Cloth and part of Mummy presented by Sergt. Adams.
Bible and Prayer Book of 1688 „ Mr. W. Cane
Key of Marlborough Castle „ Mr. Wooldridge
Old Print of Place Vendome „ Mr. J. G. Crow
Collections of Coins presented by H.R.H. Prince Leopold, Rev. W. H. Bull, Rev. G. D. Hodgson, Rev. C. Soames, Mrs. C. W. Tayler, M. H. Smith, E. A. Furneaux, J. B. Oakeley, S. T. Owen, H. Smythies, Mr. Perkins, Rev. G. W. De Lisle.

*Botany.*—

Collection of Swiss Plants presented by A. H. B. Reynardson.
Collection of Mosses „ G. E. Manisty
British Plants „ R. B. C. Everard

*Geology.*—

Basket of eggs coated with lime from Knaresborough presented by H. C. Spry.
Fossil Ostrea, fern and vertebræ presented by Mr. Piper
Stigmaria from Forest of Dean „ Mrs. Jones
Fossils from Lias near Cardiff „ G. E. Manisty
Fossil bone from Battle „ F. H. Bowles

*Entomology.*—

Foreign insects presented by E. F. Vicars
Hornet's Nest, presented by J. B. Oakely

*Mineralogy.*—

Minerals from Botallack presented by W. H. Borlase
Malachite „ H. J. Verrall
Collections of Minerals presented by Mrs. Blandy, H. C. Spry, H. S. Sankey, C. G. H. Bryan, G. C. N. Mann, C. R. Waldron, E. H. Johns.

*Ornithology.*—

Spoonbill (shot in Norfolk) presented by E. F. im Thurn, Esq.
Pair of Crossbills, (shot in Monmouthshire), presented by J. B. Oakely.
Deformed Hen's egg, presented by G. E. Manisty.
10 Indian Birds „ F. W. Bourdillon.

*Zoology—*

Chilian Mummy presented by — Paddison, Esq.

Head of Shark, tooth of Elephant, saw of saw-fish, presented by Serg. Adams.

Head of Fallow deer, presented by Mr. Parker

Pearl Mussels from Conway „ Dr. Thurnam.

*Library—*

Duke of Argyle's "Primeval Man" presented by W. W. Fowler, Esq.

Madden's Roman Coins „ W. D. Fenning

Geological Observer „ Mr. Neate.

*Miscellaneous—*

Polar Curiosities presented by Mr. Sawyer

Abyssinian bow and arms, presented by G. E. Manisty.

Three spears from Feejee Islands presented by Sergt. Adams.

Model of Canoe and ornament from Feejee Islands and 2 grass cloaks from New Zealand presented by W. S. Bambridge, Esq.

# ACCOUNTS.

| Receipts. | £ | s. | d. |
|---|---|---|---|
| In hand ... ... ... ... | 4 | 13 | 0 |
| Subscriptions from Honorary Members ... ... ... | 4 | 2 | 6 |
| Ditto from Members ... | 3 | 8 | 6 |
| Arrears ... ... ... ... | 0 | 16 | 0 |
| Donations... ... ... ... | 4 | 6 | 0 |
| Sale of back Reports ... | 0 | 17 | 6 |
| „ Reports for Christmas, 1868 ... ... ... | 32 | 2 | 0 |
| | £50 | 5 | 6 |

| Expenditure. | £ | s. | d. |
|---|---|---|---|
| Note-books for Museum Catalogues ... ... | 0 | 16 | 0 |
| Tracing of Preshute Map and Carriage of same | 6 | 17 | 9 |
| Conversazione ... ... | 4 | 0 | 8 |
| Anastatical Apparatus ... | 0 | 2 | 6 |
| Stationery ... ... ... | 0 | 5 | 1 |
| Candles, &c. ... ... ... | 0 | 4 | 6 |
| Field Day ... ... ... | 1 | 9 | 6 |
| Carriage of Spoonbill ... | 0 | 2 | 0 |
| Coins for Museum ... ... | 1 | 5 | 0 |
| Mr. Hillier's Bill ... ... | 6 | 4 | 0 |
| Books for Library ... ... | 6 | 7 | 10 |
| Printing Bill ... ... ... | 18 | 0 | 0 |
| Stuffing Pike ... ... ... | 0 | 15 | 0 |
| Balance in hand ... ... | 3 | 15 | 8 |
| | £50 | 5 | 6 |

*(Signed)*,

G. E. MANISTY,
F. GILES,
} *Auditors.*

## ADDITIONS TO THE LIBRARY.

| | |
|---|---|
| Madden's "Handbook to Roman Coins" ... ... ... | W. D. Fenning. |
| The Geological Observer ... ... ... ... ... ... | Mr. Neate. |
| The Duke of Argyle's "Primeval Man" ... ... ... | W. W. Fowler, Esq. |
| The "Student" ... ... ... ... ... ... ... ... | Rev. J. M. Fuller. |
| The "Popular Science Review" ... ... ... ... | Rev. J. M. Fuller. |
| The Ibis ... ... ... ... ... ... ... ... ... ... | Rev. T. A. Preston. |
| Entomologist ... ... ... ... ... ... ... ... ... | Ditto |
| Entomologist's Monthly Magazine ... ... ... ... | Ditto |
| The Zoologist... ... ... ... ... ... .. ... ... | Purchased |
| Geological Magazine ... ... ... ... ... ... ... | Ditto |
| Yarrell's British Fishes, 2 vols. ... ... ... ... ... | Ditto |
| Lyell's Antiquity of Man ... ... .. ... ... ... | Ditto |
| Bell's British Reptiles ... ... ... ... ... ... ... | Ditto |
| Owen's British Fossil Mammals and Birds ... ... | Ditto |
| Pictorial Museum of Animated Nature, 2 vols... ... | Ditto |
| Report of the Rugby Natural History Society ... | by the Society. |

MARLBOROUGH:
C. PERKINS, PRINTER, HIGH-STREET.

F. Madan.

# REPORT

OF THE

## MARLBOROUGH COLLEGE

# Natural History Society,

FOR THE

## HALF-YEAR,

## ENDING CHRISTMAS, 1869.

"TUM MIHI NATURÆ LIBEAT PERDISCERE MORES:
QUIS DEUS HANC MUNDI TEMPERET ARTE DOMUM."

MARLBOROUGH:
PRINTED BY C. PERKINS, TIMES OFFICE.
1870.

D.28.12.88

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# PREFACE.

THE following pages will, it is hoped, prove that the working of the Society is not less energetic than formerly, but still this is not enough. In many points much work has been done—the Museum and Library have been more consulted, the Lectures have generally been well attended, and Papers have been written by Members—but this work has been confined to a *few*—and hence though it is satisfactory to be able to record no loss of energy in the Society as a whole, still there has not been much *increased* energy. This is certainly not the half-year most productive of results capable of being recorded, but it must be acknowledged that too much of what has been done has been done by a few, and that among the other Members of the Society a very great want of interest in its success has been apparent. The Committee have felt it necessary to *require* attendance at meetings, in consequence of some Members not being inclined to show even that amount of interest in the success of the Society. They have also to record the resignation of some old Members, and the expulsion of others from this want of interest, feeling that a few really working Members are more desirable than a large number who take no interest. In addition to this fault of non-attendance, it is to be regretted that Exhibitions have been very few, and the Committee therefore take this opportunity of urging upon the Members the real necessity of more *active* interest, and of hoping that next half-year will see our meetings more numerously attended and made more interesting by a proper number of Exhibitions.

At the same time the Society has come forward to the utmost of its ability to aid the study of Natural History in the School, for it is a very remarkable fact that many Members of the School do take interest in various branches of Natural History who have not joined the Society's ranks. The advantages to be enjoyed by the Field Days are freely thrown open to all, and the prizes offered for Essays are also subject to no restriction—in fact, it must be confessed that the privileges reserved for Members are so few that it is quite possible that those, who so freely make use of these opportunities afforded by the Society, find it more convenient to remain as they are and reap the advantages than join the Society's ranks, and so have a small subscription to pay and occasionally put themselves to a little inconvenience in attending the meetings. It ought, therefore, to be a source of gratification to Members to

find that, few as they are in numbers, they are mainly instrumental in so freely throwing open these advantages to others.

Among the few remarks to be made in the proceedings of the Society during the past half-year, attention must be drawn to the following:—

A half-yearly prize has been instituted for an essay on any subject of Natural History; the particulars are given at the end of the Report. By making it a half-yearly prize it is rendered more accessible to all, and should its success be such as to warrant its being done, it is hoped that prizes for *each* branch of Natural History may ultimately be established.

The large increase in the number of our Honorary Members is very gratifying, as it shows a continued interest in the Society by those who worked for it when at School.

As the Collection of Subscriptions from so many is becoming a very serious matter, it has been decided that a payment of one guinea shall be the composition in lieu of the half-yearly subscription, and it would be a great convenience if those who can would avail themselves of this new Rule.

As some Members of the School, without having any special subject of Natural History for study, were very regular attendants at the Meetings, it was decided that free admission to the Meetings should be given to a certain number of Members of the School, who might also use the Museum and Library. As no subscription or duty was required from them, it was a difficulty to know what to call them. The name of *Medii Socii* was applied to them by the School, and as no other name had been decided on, and this name had come into general use, it was retained. The only modification next half-year will be that the *free* use of the Museum and Library will be withdrawn, and that *Medii Socii* will henceforth have to get a Member to introduce them into the Museum in the same way as any other Member of the School.

The Museum has, through the kindness of friends, been progressing. A new Cabinet of Curiosities has been added; Catalogues of the Birds, Eggs, and Moths have been completed. That of the Geological specimens is still incomplete.

It now only remains to thank those who have kindly contributed in any way to the success of the Society. Amongst those not connected with the School must be mentioned Messrs. T. Brown and Baker, of Cambridge, and Messrs. Phelps, Hawkins, Perkins, Turner, Sergeant Adams, W. C. Merriman, Esq., and Rev. J. M. Fuller. Other donations from Members of the School are duly acknowledged in the list of additions to the Museum.

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The Committee beg to call the attention of Members to rule 28. Absence from three meetings during the half-year will be considered as coming within the reach of the Rule.

# LIST OF MEMBERS.

**PRESIDENT:**
Rev. T. A. Preston.

**SECRETARY:**
G. E. Manisty.

**TREASURER:**
Rev. T. A. Preston.

**LIBRARIAN:**
E. Almack.

**COMMITTEE:**

The Ex-officio Members.
C. M. Bull, Esq.
W. D. Fenning.
E. Almack.

**HONORARY MEMBERS:**

Rev. G. G. Bradley.
A. Armstrong, Esq.
H. M. Moule, Esq.
F. E. Thompson, Esq.
W. E. Mullins, Esq.
C. M. Bull, Esq.
Rev. J. F. Bright.
Rev. J. Sowerby.
Rev. H. Bell.
Rev. C. W. Tayler.
A. Babington, Esq.
W. Fergus, Esq., M.D.
E. J. Turner, Esq.
S. B. Dixon, Esq.
F. Storr, Esq.
W. H. Macdonald, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
S. Image, Esq.
A. C. Almack, Esq.
E. F. im Thurn, Esq.
G. K. Mills, Esq.
F. Bonney, Esq.
T. R. Dumergue, Esq.
R. W. Taylor, Esq.
W. Mansell, Esq.
Rev. W. DeLisle.
R. F. Isaacson, Esq.
W. Koch, Esq.
W. W. Dayman, Esq.
H. A. Evans, Esq.
Rev. J. W. Mills.
E. C. Sewell, Esq.
J. Walker, Esq., M.D.
A. C. Hilton, Esq.
D. E. Leighton, Esq.
W. W. Fowler, Esq.
M. H. Smith, Esq.

**MEMBERS:**

E. Almack.
J. B. Oakeley.
*J. B. Fuller.
G. E. Manisty.
H. Manders.
A. H. B. Reynardson.
C. A. Sladen.
*E. L. Hesketh.
B. J. Guillemard.
H. S. Sankey.
*W. D. Fenning.
A. de B. Hovell.
*H. J. Verrall.
P. L. Hesketh.
E. H. Wyatt.
H. R. Armstrong.
J. F. Cornish.
H. C. Spry.
J. H. B. Clark.
G. C. Mansel.
T. C. Owen.
E. A. Champneys.
E. F. Vicars.
G. T. P. Cambridge.
L. W. Hinxman.
E. Meyrick.
G. H. Perry.

* Heads of Sections.

# RULES.

1.—That this Society be called the Marlborough College Natural History Society.

*Constitution.*

2.—That the Society consist of Members and Honorary Members.

*Officers.*

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by Members of the Society.

*Management.*

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other Members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

*President.*

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

*Committee.*

7.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other Member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in editing the Report.

*Secretary.*

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee, appointed by the President.

*Treasurer.*

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence that of the Secretary.

*Librarian.*

14.—That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the Donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Reports of the Society.

*Library.*

15.—That any Member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

16.—That if any Member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

*Museum.*

19.—That any Member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purpose of study, provided there be a reasonable excuse for their not belonging to a Section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

*Members.*

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.* to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1s. on election.

25.—That Members have the right to be present, to state their opinions, and a vote at all general meetings of the Society; to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the Report half-yearly.

*Visitors.*

26.—That on such occasions when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

*Honorary Members.*

27.—That Honorary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

*Suspension of Members.*

28.—That any member be liable to be excluded from the Society by the Committee if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

*Sections.*

29.—That Sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these Sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these Sections shall hold meetings as often as shall seem fit to the Heads of the several Sections, at which any member of the School with the sanction of the Head of that Section, may attend.

*Meetings.*

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

*New Rules.*

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

## MEETING HELD AUGUST 20TH, 1869.

THE following donations were announced and thanks ordered to be given to the Donors:—

A large Collection of Fossils and of Fossil and Recent Shells, by W. D. Smith, Esq.

Collections of Minerals and Fossils by C. R. Waldron, E. Swetenham, and F. H. Thirlwall.

Coins by A. W. Banks, R. M. B. Glasse, W. A. Eckersley, E. Swetenham, Rev. G. W. De Lisle, and the President.

Humming Birds by C. R. Waldron.

Pair of the rare moth *Collix Sparsata*, by Mr. T. Brown, of Cambridge.

Fresh Water Shells from the Nile, fragment from the Queen's Tomb, at Thebes, and Wild Date, by Mr. T. Baker, of Cambridge, collected by him when acting as naturalist to H.R.H. the Prince of Wales.

Head of Saw-fish, Cloak of South Sea Island Chief, Indian Brush, Esquimaux Arrows, and Play-bills printed on board the "Enterprise" during the Polar Expedition under Captain Collinson, by Mr. Phelps.

E. Almack was elected on the Committee in the place of F. Giles, who had left the School.

There were 22 persons present: 1 Hon. Member, 19 Members, and 2 Visitors.

## MEETING HELD SEPTEMBER 3RD, 1869.

THE Heads of Sections gave their Reports, Entomology alone being unrepresented. About 16 plants, new to the College List, had been found since the beginning of the half-year.

The following Donations were announced, and thanks ordered to be given to the Donors:—

Coins by G. H. Dawson, Esq.; Curiosities from Italy, by H. W. Simpkinson; Collections of Foreign Birds, by T. F. Bourdillon and C. R. Waldron.

EXHIBITIONS.

Selections from the Collection of Shells presented by W. D. Smith, Esq.; Hair Balls from the stomachs of a Cow and Calf, by the President; Ashes from the Stacks lately burnt at Huish, by E. H. Wyatt and T. S. F. Battersby.

The President gave a lecture on the Potato, its uses, products, &c., samples of each product being exhibited.

The Librarian announced the addition to the Library of a complete set of the Wiltshire Archæological Magazine, purchased by the Society.

G. T. P. Cambridge and L. W. Hinxman were elected members of the Society.

There were 48 persons present: 2 Hon. Members, 21 Members, and 25 Visitors.

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## MEETING HELD SEPTEMBER 17TH, 1869.

*Zoology.*—The President exibited a fine specimen of the Sun Fish, presented by Sergeant Adams, and the hand of a natural mummy, thrown up out of a grave at Arica, in Peru, during the great earthquake of 1868, presented by Dr. Fergus.

*Archæology.*—W. D. Fenning exhibited the title-page of a book formerly belonging to Frances Seymour, who lived in the Old House, presented by the Rev. G. G. Bradley. For an account of this leaf *vide* the *Marlburian*, Vol. iv., p. 131. E. F. im Thurn, Esq., exhibited some beautiful photographs of the silver plate found at Hildesheim, on the Rhine, in 1868, and supposed to have formed part of the camp equipage of a Roman General.

*Geology.*—H. J. Verrall gave his Report. E. F. im Thurn, Esq., exhibited a fine collection of minerals, collected by him in the Tyrol. He also presented a specimen of Asparagus Stone in Foliated Talc.

*Entomology.*—J. B. Fuller passed round a list of notices and exhibited a specimen of the Burying Beetle (*Necrophorus sepultor*).

E. F. im Thurn, Esq., exhibited some Paintings on Cobweb, executed by a Tyrolese artist.

*Ornithology.*—E. L. Hesketh announced the donation to the Society of a Red-necked Phalarope, by S. W. Featherstone, who shot it in his Father's

garden at Marlborough on the 14th inst.; also of a pair of Kentish Plovers and a pair of Sanderlings, by E. F. im Thurn, Esq., who exhibited a Fire-crested Regulus, shot at St. Leonard's, Sussex.

*Botany.*—H. R. Armstrong, exhibited a specimen of False Oat (*A. Avenaceum*), showing the formation of bulbs at the bases of the stems; F. E. Thompson, Esq., exhibited the Pod of an Indian Pea, and E. F. im Thurn, Esq., a specimen of Papyrus Paper from Syracuse, and of Vegetable Wax from Japan.

E. F. im Thurn, Esq., then read the following paper on his

## TOUR THROUGH THE TYROL IN 1869.

I am aware that serious objections can be and in fact have been made to the class of subjects to which my present paper belongs. It has been urged that they are inappropriate, and that they have but little connection with Natural History and the designs of this Society. I cannot help thinking, however, that this is a mistake, for, in the present paper at least, I shall endeavour to point out to you, as far as I am able, the manners, the customs, and the habits of the people, together with the natural and other riches of the country and the various branches of Natural History which may be studied in it.

It thus becomes an enquiry into the life history of a class of people, of a portion of the lords of Creation. Surely this ought to be as interesting to, and as compatible with the designs of, this Society, as an inquiry into the life history of an insect, of a bird, or of any other of the glorious, but at the same time minor, works of the Creator. And this is more than ever the case when the people spoken of are such a "peculiar" people as the Tyrolese, the country spoken of one of the most gloriously beautiful in the world, and one which is as rich, and perhaps richer, than any other European country in Natural History and in Archæolgy.

Such at least is my opinion, and it was with this design and with this object, that I undertook the present task, which I sincerely wish had fallen to the lot of better and more skilful hands. I have up to the present, in order to avoid confusion, spoken of our travels as having been in the Tyrol; they were however by no means confined to the Tyrol proper: and it will now be my endeavour to point out to you the countries, or rather States, through which our route led us. They were three in number, *i.e.*, Salzburg, Carinthia, and the Tyrol proper.

The vast tract of mountainous country, bounded on the north by a comparatively straight line, running along the southern extremities of Bavaria and Wurtemburg, and on the southern by the shores of the Adriatic, is known in England by the collective name of the Eastern Alps. It contains, however, a number of small but very ancient States, belonging for the most part to

Austria, to Italy, or to Bavaria. It is with the three which form the northern part of this district that we are concerned.

Roughly speaking the form of the Tyrol proper may be said to be a triangle, the vertex of which points towards Switzerland. The other two States lie in a line along the base, Salzburg toward the north and Carinthia to the south.

Such then are the relative positions of the three States, of which I am endeavouring to give you a description, towards other countries; the Local Governments, boundaries, and other differences are more difficult of description.

Taking them in order in which we traversed them, Salzburg is the first. This, till the wars of Napoleon, was one of the numerous principalities of the German stock, governed by a Prince-Archbishop, who in tyranny and other particulars appears to have been a true type of the odd mixture of temporal and spiritual rule so common in those days.

The Archbishop still exists, but the other half of his title and of his power has completely vanished, and the state is now a small province of the kingdom of Bavaria.

Carinthia has seen still greater changes of fortune. Formed with two adjoining States into the kingdom of Illyria in 1809 by the decree of the then powerful Napoleon, it fell with him and returned to its allegiance to the Austrian Empire, to whom it now belongs.

But both the previously mentioned States must yield in point of historical interest to the third, which we now come to, the Tyrol proper.

The history of its wars, of its revolutions, of its marvellous victories, and of its final defeat all in the earlier part of the present century, are subjects of European notoriety, and it is only necessary here to remind you that it is now again a province of Austria.

Such then are the geographical and political positions of the three States, and well as the boundaries are marked by actual landmarks, they are still more clearly distinguished by the feelings of the inhabitants, as well as by their patois. A native of Salzburg looks down with a feeling not far removed from contempt on a native of Carinthia, who, however, fully returns it, while they both unite in a feeling but little less strong towards the Tyrolese.

I must beg you to excuse me if I have occupied you too long with politics and geography, but the after part of my paper will be all the easier to understand, and may I trust acquire in this way a little of the interest which it looses through my bad handling of the matter.

After having dawdled away a great part of our time at Brussels, in various towns on the Rhine, at Frankfort and at Munich, we, that is my one companion and myself, arrived at Salzburg in the earlier half of August, and after a short

stay in that very beautiful city, started very late one morning to take our first very short walk.

Hallein, a small village about ten miles off, was our first halting place. It lies at the foot of the Dürnberg, a mountain or rather large hill, containing the largest and most celebrated of the salt mines, which are tolerably common in that part of the Austrian dominions.

We arrived there about five o'clock (we had dawdled dreadfully on the way), and as the innkeeper told us there would be plenty of time after dinner to go through the mines, we determined to visit them that night. This was more especially convenient, as it left us at liberty to proceed early the next morning, there being nothing else of interest in the neighbourhood.

Accordingly, we started about six o'clock and ascended for about half an hour to the small village of Dürnberg, near the summit of the hill of the same name. Here is the opening into the mines, a small bricked archway, forming a tunnel just high and wide enough to admit a man of ordinary height. Before being allowed to enter, one is equipped with a suit of white linen clothes, consisting of trowsers, blouse and cap, and with a very thick leathern glove for the right hand, and a wooden lantern containing the dimmest and worst dip that can be imagined.

We proceeded in single file, the guide first, I next, and my companion last. In this order we continued for nearly a quarter of an hour, through galleries so low that I was continually reminded to stoop, by receiving a severe blow on the head. At the end of this passage the shaft, still about the same size, descends at a sharp angle of 48°. Running along the floor of this is a rounded beam, and three feet higher a stout rope is stretched. Sitting astride of this beam and grasping the rope with the gloved hand we began to descend, in the hundredth part of a second we were slipping down at a great speed and in less time than it takes to tell, our feet touched the bottom, having come down a distance of 70 metres* in that short time. The last ten feet of the beam are at an angle of 30° so that the speed is destroyed just as one reaches the bottom.

Another long gallery and another slide of 80 metres and we were in the centre of the mining operations. There our guide lifted a trap-door, and looking down a shaft which descended at right angles, we saw the large brine lake far below illuminated by a few lights, which served rather to increase the darkness by contrast, than to lighten it. We now came to the top of the longest slide, 145 metres. The speed on this was something terrific and notwithstanding the thickness of my glove the rope took the skin off my hand. This landed us within a couple of feet of the brine lake. This is a large sheet

* One metre—3¼ feet nearly.

of water 150 metres across both ways. The roof of the cavern comes down to within a couple of feet of the water, while there is no particle of light except that from two rows of oil lamps ranged round the sides, which have a most picturesque effect, but are of little use as far as lighting the place goes.

Seated on a heavy kind of barge we slowly crossed the lake, moved, it appeared, by invisible hands, for it was only on nearing the opposite shore that I perceived that we were being towed across by an old man with a very long grey beard. This was the crowning point of resemblance, and it must have been a very unimaginative mind indeed to which the whole scene did not convey an impression of the river Styx and of Hades.

On the further side is a small cavern closed by a strong door. In this queer spot exists a very fine collection of minerals, &c., illustrative of the mine, together with some carved monuments of some of the old Prince Archbishops, to whom, by the way, tyrants as they were, monuments are to be seen everywhere. Most interesting of all, however, is a collection of very ancient tools, which were found imbedded in the salt, for the mine has been worked unceasingly since the time of the Romans. I had no paper with me to sketch and so could only attempt one or two on my shirt sleeves, which I have copied out. All the tools of any antiquity are of wood.

We still had one more slide, and then, seated astride on a bench on wheels, we were dragged through a tunnel of about ¾ of a mile in length and just wide enough to admit us. This brought us outside the mountain again, but this time at the foot, not far above the village of Hallein to which we returned very tired, but very much interested.

These mines have been worked for many centuries as is testified by the very ancient implements alluded to above. Their present annual produce is very large, and they as yet show no signs of exhaustion. Their ancient name is Tuval, by which name it is still occasionally spoken of.

We started early the next morning for Werfen, viâ Golling, both of them rather small uninteresting places, but lying in the midst of some very fine scenery. Just after passing Golling, the bed of the Salza is blocked up with some huge masses of rock which have evidently formed part of a bergfall of some magnitude. At one side of the stream just here is situated the small fortress, only used in time of war, known as the Croatenloch, from the fact of its having been held by some Croatian troops under Haspinger, to whose exploits I shall have occasion to allude again. It is a small natural cavern half way up the face of the precipice, so that it can only be approached by a very narrow and much exposed path. Commanding as it does the pass of Tueg and the whole valley of the Salza, the possession of it must have been of the utmost importance during the time of invasion.

The above mentioned narrow pass runs for some little distance along the banks of the Salza, and offers some of the finest scenery to be found in Salzburg. It was Saturday evening when we reached Werfen, and we determined to wait there over Sunday, so that we had thus an opportunity of observing the manners of the inhabitants of this valley. When addressed by a stranger they are most civil and obliging, though not over intelligent, while the women at least are very shy—so much so that unlike the general custom of that part of the world, the men only wished us a good day in passing, and they only even returned our salutation.

Neither the men nor the women can be called good looking, but they were remarkably free from the dreadful goitres so common in those mountain countries.

In this neighbourhood we found the beautiful little pink Cyclamen (*Coum*) in immense quantity, though as usual confined to one spot. It seems to prefer great woods and was growing amongst a profusion of Hepaticas, Hellebore or Christmas rose (*H. Niger*), and the most beautiful *Gentiana Pneumonanthe*.

It is worthy of notice that the Hepaticas were in several instances already in flower. It was also in that part that the pretty little Alpine Selaginella (*S. Helvetica*) was commonest.

On Monday night we slept at St. Johann, a small town with but little of interest connected with it, so that we proceeded the next day to Lend.

On the way we visited the two churches at Bischofshofen, remarkable for their great antiquity. One of them, the Frauenkirche, contains some Roman relics, a good many of which are found in the neighbourhood. One of them, an altar, has been surmounted by a granite basin, and is now used as a Font.

In the same church, on the day we were in it, were some decorations composed of Alpine flowers. The festoons were made of Gentians, of Edelweiss, of Rhododendrons, and various other bright flowers, the whole producing an effect in colour very seldom seen.

The people in this part of the world have a wonderful distrust of money, they were never satisfied with anything but copper coins, and it was most difficult to carry a sufficient supply of these.

A great part of our funds were also in the old krentzers, which are still recognised as legal, but they never would take them at their true value.

On our way from Lend to Taxenbach we found the road blocked up by a "berg-fall" or "landslip" which had come down the previous day. As we were on foot this proved no obstacle to us, as it could easily be scrambled over, but for any traveller using a conveyance it would be most inconvenient.

For the first time during our tour, we experienced a slight inhospitality at Taxenbach; the place was full of Inns, and as we only wanted dinner and were

then going to proceed we had not troubled ourselves to make enquiries as to their relative merits, but walked into the first that we saw.

All our ringing of bells had no effect in attracting any attention, and we were at last obliged to walk out and try the next. Our luck was no better, however, for they said we might sit down, and they even consented to bring us beer, but positively refused to procure any viands.

There was however one point of interest in this Inn. The swallows and martins are so tame abroad that they build in the houses, often in the most frequented rooms. In this instance a swallow had built so as to clog up a small bell that hung near the roof whenever this bell was rung; the greatest care was used not to disturb the nest, (which was however very much shaken by the operation), while the birds themselves sat on the bell.

. The third inn we tried proved a very pleasant little place, and had for a landlady the only good looking woman that I had seen for a long time.

By a long and most difficult to be found path we reached Rauris after having said good bye to the Salza, along whose valley we had been walking all the time.

It is eminently a mining valley, for, besides the salt-mines, there are in several places copper and iron mines. Its agriculture is poor, at least at this southern end of the valley, the crops consisting chiefly of maize and hay, with but very little corn. At the northern extremity a good deal of corn is grown.

The level of the Rauris Thal (which we now entered), is considerably higher than that of the Salza, from which it is completely shut off by high hills. It is traversed by a single cart track, which is now and then tolerably good for that part of the world, but in most parts is nothing but a corduroy road, which style of track is often to be seen in most of these valleys. The fir trees are just cut down, the branches lopped, and then the trees are laid across the ground to the cost of any one who may have the misfortune to be driven over them.

The present valley is very seldom visited by any but the regular inhabitants, and we, as we trudged along, our knapsacks on our backs, were a constant source of wonder to the very inquisitive inhabitants.

The small town of Rauris is beautifully situated, nestled among the high hills. I have called it a town, as it is said to be such by the inhabitants, though village would seem to be the more appropriate.

We were most hospitably received in the small inn, which, though its exterior appearance was not promising, proved the most comfortable I ever was in. Should any here present ever be in the neighbourhood, I should recommend them to make this their headquarters for a few days.

The landlord supplied us with letters of recommendation to the "hütman" or overseer of the gold mines, which we wished to visit, and with

plenty of advice with which we started at 5.30 a.m. Before we left the level of the valley the track passed through rows of wooden palings, on which hundreds of wasps had built their nests.

The nest is always open, and in very few cases were they more than two or three inches in circumference.

The great abundance of the mountain ash was also remarkable. For six hours we wound up and down among the hills seeing an interesting bird or plant occasionally to enliven the way, amongst the former of which an Eagle Owl (*Stryx Bubo*) and numbers of Dippers and Water Ouzels (*C. aquaticus*) were especially observable. As we passed higher and higher we entered the fir forests which were carpeted with bilberries, Alpine strawberries and a most exquisite little partridge berry. At last we reached the small cluster of houses known as Kolm-Saigurn, where are the head-quarters of the miners and where the gold-ore is crushed and extracted by amalgamation in the usual way.

The Kolm consists of four long low huts built under the precipice, which rises for 700 clafters or 4,800 ft. above it.

Of these huts three are devoted to the hütman and the miners, while the other contains the machinery for gold-washing, etc. We had forgotten to bring any provisions with us as we ought to have done, and as we were half-starving we enquired as to whether they could give us anything to eat.

"But beef is rare within these oxless isles,
Goat's flesh there is no doubt."

Goat's flesh, brandy, and the hardest of black bread formed our meal. But alas! if the goat of which we were partaking had seen one year, it had seen twenty before it fell to the butcher's knife, and in consequence it gave suggestions by no means of otto of roses. Anything so dreadful it was never my misfortune to come across before, hungry as I was it was impossible to touch it. The hütman was civil enough, though not very polished in his manners or speech, and gave us free permission to use the machinery. Accordingly he conducted us to the back of his house, where there was a small car waiting, the ledge round which was about 1½ feet high. At the bottom of this we lay pressing our feet against the ledge (there was only room for our two selves).

Then we were drawn up by one long rope. The car of course turned up on its edge and we were suspended in an upright position by one rope. In this way we were dragged up precipices which in most instances were at an angle varying from 60° to 80°, and this lasted for seven hundred clafters, or, what will give you a better idea, over three-quarters of a mile. All this was in the midst of the bitterest cold, rain, and snow. When we reached the top we inspected the machinery which drags up this wonderful lift and found it very simple, a wheel moved by water power.

A severe snow-storm had now come on, in the midst of which we walked still higher to the Berghaus, a large desolate building 7,700 ft. above the sea, surrounded by glaciers which approach to within a few feet of it. In this is the entrance to the mine, and here eighty men are constantly at work, winter and summer. Even on that 20th day of August, the wild desolateness of the situation, the blinding snow, thick clouds, bitter cold, and vast expanse of glacier, produced such an awful effect of savageness and hardship, that my mind can scarcely conceive it possible for human beings to spend the winter there. Such is the case, however, though at a great sacrifice of life, for the miners never live long: and even dogs and cats kept up there are said only to live for a few weeks.

We now entered the mine, forcing ourselves through passages reeking with dirt and deep in running water. These galleries were sometimes so slanting that it was impossible to enter without using one's elbow. Then the shaft ascends at a perfect right angle for a distance of 200 clafters, up which run ladders. Up these we had to climb holding on with one hand to the spokes, which were literally dripping with grease, with dirt, and everything horrible, to say nothing of the fact that the shaft was in many places so narrow that it would not admit my body and my lantern at the same time, so that it required some little manœuvring. From this run out the lateral shafts which are now being worked; several of these we visited. Thick veins of gold run along the roof, and the men on their backs or their sides, or in whatever position they can best get at it, pick all day long with small hammer-like tools. Even for us to examine the gold it was necessary to assume the most awkward positions. Then came the worst part, descending the ladders again, for the lantern had to be carried above the head so that the lower depths were lost in darkness; while in many places there were great gaps in the ladders. The outside was however reached at last.

Our object now was to strike across the Goldberg and Hochnarr glaciers to Heiligenblut, in Carinthia, and as it was already three o'clock, we had to hurry in order to cross before nightfall.

We started with one guide over the Goldberg glacier, intending to take the Hochnarr pass. The clouds and snow had however increased to such an extent that it was impossible to see ten yards before us; in consequence of which the guide soon advertised me of the fact that he had lost the way, by telling me suddenly, "Many people lose their way here, and when they do they don't generally find it, they generally fall down crevasses. Two miners were killed here in this way yesterday." It is a curious fact that the Carinthian and Tyrolese guides lose their heads and get frightened in this way much sooner than the Swiss do.

In the course of our wanderings on the Névé I picked up a privet hawk-moth lying on its back and frozen down to the snow. Thinking this an odd place for it, I put it in my pocket handkerchief, intending it for some of my entomological friends.

We were then, I take it, very near the summit of the Goldberg Spitz, and by great good luck managed to find a passable way down. By 7 p.m. we were off the glacier, and taking half an hour's rest in a chalet, more than glad to get delicious milk, butter, and black bread after our long fast. When we reached Döllach at about 9.15. the people at the inn had already retired to rest. They were soon knocked up, and we got to bed. In undressing I was surprised to find my privet hawk-moth had revived, and was apparently as well as possible. The next day found us at Heiligenblut the "head centre" of the best Tyrolean excursions. The visitors' book is full of interesting accounts of adventures; many ludicrous, several mournful, giving accounts of fatal accidents. The interests of Heiligenblut are so great that I dare not linger over them for fear of prolonging my paper beyond its allowable limits. The place takes its name from a sacred relic preserved there with great care. The legend has only once been told in English, by Messrs. Chapman and Hall. As their version has had many accusations of incorrectness brought against it, I venture to give you the following, translated by myself from the inscription in the Church. It will be seen that in my version I have sacrificed every other consideration to literalness.

A SHORT ACCOUNT OF HOW THE BLOOD OF THE SAINTLY BRICCIUS WAS BROUGHT IN A WONDERFUL MANNER FROM CONSTANTINOPLE TO HEILIGENBLUT, A.D. 914.

Briccius was descended from a noble family of the kingdom of Denmark. When still a boy he came with his father to Constantinople, where the latter was enrolled in the Grecian army in order to fight against the Saracens. The father died soon after he had entered the Grecian service, and was obliged to leave the promising youth behind among strangers. Briccius found, however, in the royal commander, Andronicus Ducas, a second father. The youth grew up fast, and gave proof of great piety. Bravery, unsullied virtue, and far-famed deeds, soon won for him the confidence and the goodwill of the discerning Emperor Basilius, which was also bestowed on him by his successor Leo. Briccius fought as a herald in all engagements, shielded by virtue and innocence; he saved the Emperor's daughter Eudonia herself from the hands of ruthless captors, and in all his deeds he remained firm to the tenets of the Catholic faith, which the father had implanted in the susceptible heart of the son. He therefore saw with great grief that religion and virtue itself were not attended to at the Grecian court, and as he thought such a condition to be at

variance with his own well-being, he determined to retract his pledge and to beg for permission to depart. The Emperor Leo was not a little displeased at this determination and at first called Briccius an ingrate. "You blame me too severely, most noble Sire," answered Briccius with respect. "Never will the feeling of gratitude towards that noble prince, who taught me to style Greece my second fatherland, die out of my heart. But higher duties call me home, and their call must be sacred to me" .....Leo, softened at this reply, spoke....."First ask a Princely gift of me"..... "Well," said Briccius, "On the high altar in the church of St. Sophia is a bottle containing the drops of holy blood, which flowed out of a picture of Christ, which had been pierced by an impious Jew. It is that bottle which I ask for." Thereupon said the Emperor, "The patriarch will deliver up to you the holy relic." Briccius clad in pilgrim's clothes, set out by a side way, for fear of the Greeks, who were angry that the holy blood should pass into strange hands. Over the Alps he directed his way to Salzburg, but he only reached the border of this land, for not far from the present village of Heiligenblut, his strength gave way, and after a heavy snowstorm he fell down a corpse. The body was seen by some passing peasants, who brought the body on a cart which they had fetched, intending to bury it in the ordinary God's-acre. But suddenly the oxen stood still; the body was taken off and there buried. But one foot protruded from the grave, on which a bandaged flesh wound was seen containing a small green bottle with some drops of a dark red fluid. Thus the Carinthian Church became possessed of a priceless relic.

I shall not trouble you to follow us in all our wanderings, in the course of which we visited Lienz, Windisch-Matrei, and Pregratten. The latter place is celebrated as a store-house of the rarest minerals of which I procured at different times a fine collection. From here we crossed the very long range of the Dorfer-Sulzbacher glacier between the peaks of the Gross Venediger, Gross Geiger, &c. This is certainly a most magnificent glacier pass, though so long as to require two days. Even though we slept half way at the Johannishütte, we had a good fifteen hours walk to get down to Kriml. Time prevents me from telling you as I had intended of the celebrated Krimler Ache (water fall) or of our adventures in a most violent storm which brought down three vast landslips across our path. We made straight across the country to Innsbruck where we arrived just in time for table d'hote one evening, during the course of which we heard for the first time of the victory of the Oxford crew over the Harvard. That is we did not hear it till seven days after the event. In fact we felt very much the same as poor Rip Van Winkle; we seemed to have been out of the world and its news.

In conclusion let me draw your attention to a very remarkable form of

industry practised by a family of peasants near Innsbruck. The large thick cobwebs are collected, sketched on, and a water-colour painting is made on it with a soft camel's hair brush.

These pictures find a ready market at prices varying relatively to the excellence of the work, from four to eight gulden.

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F. J. H. Jenkinsen resigned, and J. T. Fullerton was elected a member of the Society.

J. B. Fuller was appointed head of the Entomological and E. L. Hesketh of the Ornithological Section.

There were 67 persons present: 3 Hon. Members: 20 Members: and 44 Visitors.

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## MEETING HELD OCTOBER 1ST, 1869.

There were no exhibitions in order to give more time for the following paper by F. Madan, on

## THE SOLAR SYSTEM WITH REFERENCE TO THE PLURALITY OF WORLDS.

SOME apology is needed at the very outset for introducing to the Natural History Society a subject which does not, strictly speaking, come within the range of its pursuits and is devoid of much of that practical utility which is an essential part in every science learnt at School. Those who know nothing of Astronomy simply think it a very curious science, and think that on looking through telescopes they will see wonderful flaming globes in the sky, that all the fixed stars will be much magnified in size and that the constellations of the Ram and the Bull and such like only require to be seen through a sufficiently large telescope for them to verify their names by their actual appearance. However I am not without precedent in the course which I am pursuing, for no one, I think, found Mr. Rocke's paper last half either uninteresting or useless. There is a difficulty which I feel in approaching the subject, and that is, I do not know how much you yourselves know about it, how much I have to build upon, for some, I fancy, can hardly be supposed to know anything about it, yet the animated discussion which followed the Astronomical Paper read last half-year and the latent knowledge it seemed to bring out after the most violent protestations of total ignorance on the subject which I heard on every side before the paper was read, make me tremble lest some one should rise in the middle of my argument, and triumphantly prove me to have been wholly in the wrong. I will now apply myself to my subject.

In the earliest ages the world on which we dwell was supposed to be the largest body in the universe—it was supposed to be an immense plain, stretching, no one knew how far, in every direction, and just diversified by large mountains and ranges of hills. How the sun managed to penetrate this mass of matter every evening when it sunk, and again every morning when it rose was a profound mystery to all—whether it actually passed through or got round the edge of it, or whether it was extinguished, as the poets sung, in the waters of the western ocean and re-lighted every morning in the east; all this it was found impossible to decide. Below the earth they naturally placed darkness, and all the gloomy horrors of Hades and Tartarus, while above the skies the deities were supposed to dwell in realms of light beyond our ken. The stars were to them only so many bright points studding a crystalline sphere which carried them round every day,—and let them emit a few glimmering rays, and adorn, as it were, the ceiling of our sky. This was the original idea of the universe, shared apparently in the very earliest times by all the races on the face of the earth.

The first occurrences which disturbed the minds of these serene philosophers were the movements of certain of the brightest stars which seemed to possess a motion not only *with the others*, but also independently both of each other and of the rest of the stars. In time came a new theory to help them out of their difficulty and that was the one which later on developed into what is known as the *Ptolemaic System*. Briefly it was this—that the earth was a quiescent globe in the centre of the universe, and that these planets —or, as the word implies, "wandering stars"—which had occasioned the new theory, *revolved round* the earth in so many different spheres placed one above another. The moon was naturally supposed to be the nearest to the earth; then came Mercury, Venus, the Sun, Mars, Jupiter, Saturn, and finally the sphere which carried all the fixed stars. This theory was held for many centuries by all but the Chaldeans—who, as Procter satisfactorily proves in his "Saturn and his System," had a clear notion of the true theory. Indeed it is believed that the accuracy with which the relative distances of the planets were known to the ancients sprang *from* these Chaldeans, who based their knowledge on their truer ideas of the universe.

But unfortunately, to all but the Chaldeans and possibly some other nations of the Semitic family, the motions of the planets were so extremely eccentric in every way, that it required the greatest ingenuity to invent celestial machinery which could even pretend to account for their movements. This was—when fully developed—as I have before hinted—the Ptolemaïc System. Some of the difficulties which had to be coped with were these—planets, instead of peaceably revolving in decently circular orbits, not only moved at distinctly varying rates, but sometimes stopped altogether, and

sometimes actually moved back; the sun did not rise so high in winter as in summer, and sometimes, perhaps on the eve of a great battle, would be entirely eclipsed. Such amiable eccentricities on the part of the Sun and Planets, instead of making the astronomers cast about for a new system to explain these defects in their existing one, only had the effect of making them multiply their machinery, and attribute checks and stoppages to the existence of friction in various degrees between the crystalline spheres, which I will now describe. Each planet was supposed to be fixed in the *surface* of a vast *hollow ball* or sphere of crystal, and these spheres were placed one on the top of another, revolving independently of each other and with no friction, except when the friction was thought necessary for the reasons given above. So that their universe was exactly like an onion—the earth was in the very middle of all and each succeeding layer in the onion was the crystalline sphere of a planet, while if we make the outside layer speckled, we have the sphere of the fixed stars which bounded all the others. So the next time you eat an onion, pray consider that you are swallowing a model of the Ptolemaic system of the universe. These spheres were technically called "*cycles*" and "*epicycles*," and with the help of a *prime mover*, the great "primum mobile" of the ancients, they went revolving round and round, grinding and pounding away in the sky above us. Cicero, in his "Somnium Scipionis," makes each sphere have a different sound, and to him the "music of the spheres" was no unreality. But to account for our not hearing these celestial harmonies, he supposes we are like the tribes living by the Egyptian Cataracts, who grew deaf from the tremendous sound unceasingly dinned into their ears by the water. You can see at once why these spheres were supposed to be crystal—because it was the only way by which the fact of the fixed stars being seen brightly could be reconciled with the existence of actual material spheres revolving above us.

Well, this Ptolemaic System satisfied the world for many centuries, was pronounced true by the infallible Pope, and remained in possession of the field, till, roughly speaking, Copernicus' time, about 1580. He was the first who dared to make his views of the new theory of the motion of the earth public, but did not live to enjoy its success. Galileo, one of his followers, dared openly to avow his belief in the new System, and was promptly persecuted for it. We all know the story of his being made most solemnly to recant his views and to uphold the immoveable position of the earth, and how as he rose from his knees he whispered to a friend "*and yet* it moves." A similar persecution befel one Spigelius, a bishop of Upsal, for believing in the existence of the antipodes. How was it consistent with the dignity of a Pope to sanction a belief in men who, compared with him, actually had the impudence to stand on their heads? By and by the Copernican System, as it

was called from Copernicus its first and foremost supporter, entirely supplanted the old one, and every year it plants fresh conviction of its truth in the minds of scientific men.

The Copernican System in its main features I need hardly describe—that the Sun is the comparatively fixed centre of the Solar System, that Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune revolve round it in nearly circular orbits—and that while the Sun shines by its own light, the planets only reflect the light they receive are facts too well known for it to be necessary for me to dwell on them. I would now propose to take each of the bodies of our System, and point out what will interest you in each. I will begin with the Sun.

*The Sun* is the only perfectly circular globe, which we *know* to be such, in all the universe. All the planets are more or less oblate spheroids,—that is they appear *flattened* at the poles and bulging out at the equator, like an orange. On the disc of the Sun, we can discern absolutely no deviation from a perfect circle. Of course the chief point worthy of attention in the Sun is the existence of its *spots*.

The photosphere or disc of the Sun appears evenly bright to us, because it dazzles us too much to allow us to see any defects of light, but in reality the smallet telescope, by the aid of a dark glass, will usually show one or more groups of dark black spots on the Sun's surface. The number of spots attains a maximum every 11 years, as was found out by Schwabe, a German astronomer, by induction from daily observations of the Sun for 33 years. For instance, this very summer happens to be one of the periods of maxima of spots, and so the number will gradually diminish from now till the winter of 1874, when they will again increase till 1880. Now this period of 11 years *exactly* tallies with the period of all magnetic variations on the earth, and so we may confidently assume that both of these phenomena have a common origin—perhaps the result of a reaction of the planets on the Sun. Every spot consists of two parts—a perfectly black "umbra" or "nucleus," and a grey "penumbra" as it is called. The shape of these nuclei varies immensely, as also do their permanence and size. You can easily imagine them—perfectly black, irregularly shaped spots, surrounded with greyish borders all round, and dotted about on the disc of the Sun. Into their origin I have not time to go to-night—suffice it to say that they are probably breaks in the burning gas which surrounds the Sun, through which we see the dark body of the Sun itself. There is a great controversy on this subject still going on. From the motion of these spots, the revolution of the Sun on its axis has been found to be nearly 25½ days.

It is noticeable that no parts of the Sun except what we might ironically call the temperate zones have spots: there are none at all near the poles, and

very few and brief ones near the equator. I do not maintain the habitability of the Sun, not because it is impossible to conceive it, but from the absence of any proof for or against it. Accordingly the fixed stars, the vast majority of which are themselves Suns, are not believed even by the supporters of the theory of the Plurality of Worlds to be certainly inhabited. And my opponents may say—"Well you say there are no inhabitants of the Sun, and none of the fixed stars. So you exclude all the universe except our own system at one stroke, and yet maintain the general theory of more worlds than one. Why should all the human life of the universe be concentrated on an obscure star in the Milky Way," as our system undoubtedly is. This is what they might say—but I would have these gentlemen observe that it is by no means sure that these fixed stars have no planets revolving round them, invisible to us. Sir John Herschel believed that certain small attendant spots of light near various stars (of which he mentions the names, but which are too technical to name here) are actually planets, and this is extremely probable from their appearance.

Next we will take Mercury, which is generally supposed to be the planet nearest the Sun, and which revolves at a distance of 37,000,000 miles from it. I say *supposed* to be nearest, for there are abundant proofs of the existence of at least one other planet between Mercury and the Sun—partly from circular black bodies being seen in transit over the Sun, and partly from disturbances in Mercury's orbit arising from the attraction of other bodies. The one most certainly known has been called Vulcan, and its period has been actually calculated. On Mercury's surface few discoveries have been made by the telescope, owing to the dazzling splendour of its rays, and to the short interval during which observations on it can be made from its closeness to the horizon; for, its orbit being so small compared with ours, it is never at an angular distance of more than 30° from the Sun, and accordingly even when the Sun is but just setting, its height above the horizon is hardly sufficient to let it escape the vapours and atmospheric disturbances which cling to the earth. The phases, however, by which at one time it appears as a crescent, at others gibbous, as it is called, and at others full, exactly like the phases of the Moon, can be easily seen and also distinct traces of an atmosphere. Mercury, however, has no satellite that we can discover, and it and Mars are the only two in our system which appear to be without any "lesser light to rule the night." Its transits across the Sun are comparatively frequent—there was one on the 6th of November last, and there is an average of one about every six years. Mercury's year is 88 of our days. The light which falls on Mercury is seven times greater than that which the earth receives—and on such facts as this about the relative increase or decrease of light and heat in different planets the opponents of the Plurality of Worlds base many of their arguments. Mr.

Rocke's fervent imagination dictated these words to him about the inhabitants of the inferior planets—"that microscopic creatures with silicious coverings, which are said to be almost indestructible by heat *may tenant* the planets, but of other inhabitants it is absurd to dream." But let me take this one example and show of how little value these remarks are. The light which Mercury receives is seven times that which the earth receives—what use would such eyes as ours be in such a continual and increased brilliancy of light? Well, the *only* change necessary in our eyes would be that instead of the pupil of the eye being one-eighth of an inch in diameter as it is, it should be one-fiftieth of an inch, when we should be able to see with perfect ease and distinctness. This is surely no great change to be made in our nature, yet this is what, according to Mr. Rocke, it is absurd to dream of. I lay stress on this, because it is a perfectly fair example of those crushing arguments brought against us by Mr. Rocke and his adherents, and also of the way in which they may be met. Again, the heat which Mercury receives would be seven times as great as what *we* receive, or, taking the average heat of our globe to be 50° of Fahrenheit, Mercury would enjoy a temperature 138° above boiling point, which sounds pleasant. But in reality, as I have been reminded, the heat received on a globe depends on the diathermancy, as it is called, of the atmosphere, that is, the degree to which the vapours visible and invisible suspended in the air *allow* the heat to pass through them, and also on the degree to which they allow the heat radiated from the globe to escape into the ether above, and thus we have only to imagine a thicker atmosphere on Mercury to make it perfectly inhabitable. Mercury is 300 miles in diameter and its day is within 8 minutes the same as ours. It is therefore the smallest of the planets with the exception of the Asteroids.

Venus is the next planet in order and is the nearest to the earth. Venus is the morning and evening star, called in Greek poetry Phosphor in the one case and Hesperus in the other. It is called *the* morning or evening star for two reasons: 1st because of its excessive brilliancy and apparent size; 2ndly from its always being within 40° of the sun, and it is thus most conspicuous when appearing to lead on the day or follow its departure either before or after it—unlike Jupiter, which is the only planet which can rival Venus in brilliancy. Its distance from the sun is 68,000,000 of miles and its day is about 35 minutes less than our own. As being in some portions of its orbit the nearest planet to ourselves, we might have expected to make the greatest discoveries on its surface—but the extreme brightness of its reflected light has disappointed all the eager search into the nature of its surface. I will quote what Sir John Herschel says of it — which will show the difficulties attending the enquiry. He says the intense lustre of its illuminated part dazzles the sight and exaggerates every imperfec-

tion of the telescope: yet we see clearly that its surface is not mottled over with permanent spots, like the moon, we notice in it neither mountains nor shadows, but a uniform brightness, in which we may indeed fancy, or perhaps more than fancy, brighter or obscurer portions, but can seldom or never rest fully satisfied of the fact. Herschel also infers that we do not see, as in the Moon, the real surface of this planet, but only its atmosphere, much loaded with clouds, which may seem to mitigate the otherwise intense glare of their sunshine. I believe Herschel is found to have rather overstated the impossibility of detecting permanent spots, but still the fact remains that we know *very little* of this planet.

Its phases are the most easily discernible feature and these were the first proofs which convinced Galileo of the truth of the Copernican system. To astronomers Venus is celebrated, as the means by which we have determined the distance of the Sun from us—into the method of finding which I have no time to go. The quantity of light received by Venus is about double that of the earth, and it has been found to be attended by a small satellite or Moon. Of our earth I need say nothing, for what does this Natural History Society do, except busy itself with the different sciences which concern the surface and constitution of this planet?

Next we come to the *superior planets*, as those are called which revolve in an orbit larger than our own—as opposed to the *inferior* ones of which I have been speaking. You can at once see the difference in the apparent motions of the two kinds—the inferior planets *can* pass between the Sun and us, as their orbits are smaller, but can *never* appear on the opposite side of the Sun to us.—For example, if you put a sixpence on a shilling and count the rim of the sixpence to be the orbit of an inferior planet and that of the shilling to be our own orbit, you see that no portion of the rim of the sixpence can get *outside* the shilling, as it were. It is the opposite with the superior planets.

*Mars* is only about half as large as the earth, but presents the most intelligible features of any object within our reach.—All its continents have been mapped out, and names given to the great seas and lands and a Martial map can be traced out with considerable exactitude. The whole planet has a reddish tinge, and I believe it is established as a fact that the earth would have the same tinge, if seen from the moon. The land appears orange, and the seas a dull greyish green, while the proportion of land and water is reversed compared with the earth. Here every continent is an island, there every sea is a lake. I will now approach the most interesting feature of all, and one which gave rise to a violent discussion after Mr. Rocke's paper, and that is the supposed polar snows. There is no doubt of these facts—that white spots have been seen like caps over the poles of Mars, extending about 10° from

the pole—that they have been seen to *decrease* during a Martial summer and *increase* during a winter—*alternately* of course as each hemisphere is turned towards the Sun. That the bright light reflected from them might well be from snow; that movements have been observed in the edge of them, and that darker belts often accompany the edges such as might be produced by a *thaw*. After this I see little reason for doubting the existence of snow and consequently an atmosphere analogous to our own. I daresay the doubts raised in the minds of the more learned of my audience will be expressed after the paper.

Of the *Asteroids* I need say little—they are comparatively small globes—above a hundred in number, revolving in nearly equal orbits between Mars and Jupiter. The four chief are known as Juno, Ceres, Pallas, and Vesta. They are supposed to have been the fragments of some large planet, shattered in pieces by an internal convulsion; some of them are about 4 or 5 miles in diameter, while the larger are about 2000. Though the orbits of some of them actually intersect, it is found by higher mathematics, I believe, that it is impossible that there should be a collision. The smaller ones are entirely invisible to the naked eye, and it is curious to think how little planets that we could never see with our eyes have been caught, followed, and identified through the telescope, in a region which would have seemed put by nature beyond our natural reach.

*Jupiter* is next—the largest body in our system, except the Sun—it is nearly 90,000 miles in diameter, and, in spite of its tremenduous size, revolves in less than 10 hours. The consequence of this is naturally a very great depression at the poles and elevation of the equatorial regions. It is of much less density than the earth, but its immense bulk more than makes up for this—so that instead of the power of gravitation at the surface being less than what *we* feel—as may be expected from the *light* substance of the planet compared with ours—it is actually nearly 2½ times as great. I will speak of the possibility of beings like ourselves living there under so great a pressure when I come to Saturn. Jupiter's year is equal to nearly twelve of ours, and it is nearly at its opposition now—the very bright star to be seen as you come from Chapel in the evenings, just over B house, is Jupiter. Its day is *ten hours* only; on the surface of the planet are always to be seen dark stripes, called Jupiter's belts. They are always nearly parallel with the equator and sometimes change their shape in a few minutes. These belts are the real body of the planet, seen through the great white canopy of clouds which reflect the light of the sun to us. The breaks in the clouds are caused by trade-winds apparently, which are naturally much more violent than on the earth, inasmuch as the movement of the equatorial parts of Jupiter is at the rate of 28,000 miles an hour, while ours is only at the rate of 1,000. Jupiter is attended by four satellites,

which revolve round it at different distances,—a moonless night is a thing unknown on Jupiter—for by a curious design the sum of the longitudes of the three nearest satellites to Jupiter is always 180°, so that if two of the three are below the horizon at any part the third must necessarily be above. The rate at which light travels was first found out by means of these satellites, in this way: the satellites are regularly eclipsed by their primary, they disappear behind Jupiter, and reappear after about three or four hours. Well, it was not hard when the periods of the satellites were known, to calculate when these eclipses would take place—but when Jupiter was farthest from the earth these calculations were *always* 16 minutes wrong. The eclipse was *later* than it should have been, and when Jupiter was *nearest* the earth these 16 minutes of error vanished. And so it was found that light from these satellites took 16 minutes to traverse the diameter of the earth's orbit, that is 184 millions of miles—and hence light was discovered to travel 192,000 miles a second. I will now pass on to Saturn.

Saturn is of all the most *wonderful* planet. It is a little smaller than Jupiter, but has 8 moons and an immense treble ring entirely surrounding the planet at a distance of about 80,000 miles from it. Galileo first saw this ring, but he thought he saw a treble planet—Saturn *between* two globes. The two outer rings are by far the brightest, and are supposed by Procter to be composed entirely of myriads of small satellites wheeling round, *independently* to a great extent of each other. The inner ring is much fainter, and has only recently been discovered. The appearance of the whole to Saturn's inhabitants must be something like that of a vast rainbow in the sky. Yet the thickness of these rings, whose combined breadth is 30,000 miles, is only 100 miles at most, and is almost entirely invisible when its edge is turned towards us. I cannot stay longer on Saturn, in spite of its great interest, as I have hardly justified the second part of the title of my paper yet.

Of Uranus and Neptune I need say nothing, they being too far from us and the sun to present points of any great interest—the light is reflected most dimly from them.

I have no time to speak of many curious facts concerning the Solar System as a whole—of the *regular increase* of distance of each planet from the Sun—of the curious ratio between the periodic time of a planet and that distance, and such like things.

Thus I have in a way scrambled to the edge of the Solar System, through 3,000,000,000 of miles with the universe and its representatives here, sleeping calmly round me. I now have to examine the question of the Plurality of Worlds and Mr. Rocke's paper.

As far as I can make out, my best plan will be this—to leave out the Geological question, which Mr. Rocke introduced, for while I myself am quite

incapable of entering into it with sufficient knowledge, there are plenty belonging to the society, to whom it would not be by any means uninteresting and might form a subject for future enquiry independently of refuting specific arguments. I will also restrict myself to those portions of the paper which concern the Solar System.

Mr. Rocke took Neptune, which receives $\frac{1}{900}$ of the light and heat we receive. Well as to the light, if cats and bats have a power of seeing in the dark 20 times, I daresay, as great as our own, and yet this is not thought anything very wonderful, while the eyes as a whole are not out of proportion to the size of the animals themselves, I cannot see that it is a very violent change in human nature to possess eyes which can see 900 times as well as we can.

Besides, listen to what Procter says: "It is probable that our own earth once received much less light than at present. This is indicated by the size of the eye-orbits in many extinct species of animals, and by the development attained by creatures of the bat kind, which now form an insignificant class of the earth's inhabitants. Thus Hugh Miller, speaking of the fossil remains of animals of the secondary division, says 'enormous jaws, bristling with pointed teeth, gape horrid in the stone, *under staring eye sockets a* FULL *foot in diameter.*'" This is what Procter adduces to prove the habitability of *Saturn*, and not much can be said against it.

I will take Saturn as an average specimen of the difficulties fixed on by Mr. Rocke. It seems impossible to doubt that Saturn is inhabited by living creatures of *some* sort. *Here* on our planet we find that not only the earth, but the fathomless depths of ocean, not only the temperate zones but the scorched regions of the tropics are all crowded most abundantly with living creatures,—and also that through many millions of years, during which most startling changes have swept over the earth, the same abundance of life has been found upon its surface. That a globe so stupendous as Saturn—I am quoting Procter's words—and surrounded by a system so magnificent and elaborate should be entirely devoid of inhabitants can hardly, then, be reasonably be imagined. Now on Saturn's *equator*, a human being would feel *no extra* pressure or diminution of the force of gravity, and in the case of other planets, just as birds can combine great lightness with immense strength, so why should not the inhabitants of other worlds? Saturn is not of the density of *cork*, as Mr. Rocke ventured to state, but of *oak*, and if this planet were of oak, we could build houses, &c., very well and find no great inconvenience—unless it caught fire.

The Saturnian Seasons are very like our own; the planet's poles are inclined at an angle 26° 50′ from being perpendicular to the plane of its orbit —while ours are 23° 28′—no great difference. The Rings serve to illuminate the short summer nights and darken the long winter nights, but this indicates

no abnormal variation of light or temperature. It is not very pleasant to have an eclipse lasting for 6 years (not 15 as Mr. Rocke observed), as some portions of Saturn do, but they make themselves very comfortable, as I have no doubt.

In our Arctic regions the sun never rises for six months, and I have not yet heard Mr. Rocke argue against their habitability from that cause—perhaps that is to come.

Of Jupiter Mr. Rocke says that it *must be composed of water!* owing to its oblateness of form—well, I have but just explained this, as being the result of extremely rapid rotation on its axis, and on this theory is based all his arguments about it.

Of Mars, he has really said little worthy of refutation. Of his theory of Venus and Mercury, I have already spoken.

The *Moon* is a *satellite*, and not a *planet*. I hope all will bear that in mind; the Moon has a distinct use—to give us light—the planets *cannot* be said to be satellites to the Sun, and so there is a radical difference between the two kinds. The Moon is almost certainly uninhabited. Proctor believes it to be a sheet of ice, and nothing more—it certainly has no atmosphere now, but equally certainly had at one time—a Volcanic Agency, such as we see on its surface, required some vapour or atmosphere for its existence at all. I maintain that we can not argue from the *Moon* to the *planets*, or vice versâ.

Lastly, I come to some positive arguments for the Plurality of Worlds. I will put them in almost syllogistic brevity, as so little time is left.

1. The magnitude of the surface of the planets is 397 times that of the earth or 78,000,000,000 of square miles. Can all this be barren and unhabited? it is surely a gloomy and distorted view of the Creator to suppose it.

2. The general similarity between the bodies of the Solar system seems to point to a similarity of design. They are all splendid, all solid, all revolve round the sun, all turn on their own axis, all derive their lustre from the sun, and are all under the influence of gravitation.

3. Their *special arrangements* are well adapted for the enjoyment of sentient beings. For they possess diversity of scenery, mountains and valleys &c., are environed with atmospheres, have provision for the diffusion of light, heat and colour, and have moons to light them.

4. Every part of nature seems destined for the support of life, matter is framed for the purpose of mind.

5. The theory gives us a more exalted idea of the Creator's wisdom and benevolence and power.

6. No deviation has ever been found from this rule, that whenever any one perfection of the Deity is exhibited, there all His attributes are at work.

7. And lastly, according to the opposite theory, light is distributed to the different planets in vain—in vain is the time measured naturally by days

and years, in vain the seasons are changed, in vain earth's many voices are heard, in vain is heat showered down,—for there is nothing to receive it—perfect barrenness, and interminable solitude are chosen to receive the choicest gifts of the Creator.

I recommend these arguments to the consideration of every one here, who is still awake, and hope that as many last half, were so readily convinced by Mr. Rocke's arguments that there are no inhabitants in other worlds: so they may after due deliberation change their minds and be found at last in that long list of illustrious men, who have found something repugnant to their reason and conscience in the denial of the Plurality of Worlds.

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J. W. Hockin and C. F. Harrison were deprived of membership for non-attendance at the meetings during the last and present half-years.

A new rule was made: "That any member absenting himself from three meetings during the Half-year, without sufficient reason, cease to be a member of the Society.

Persons wishing to attend the meetings of the Society, but without any further privileges, may do so by permission of the Committee, which permission will have to be obtained every quarter.

The name of *Medii Socii* has since been given to such persons.

There were 43 persons present: 1 Hon. Member, 23 Members, and 24 Visitors.

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## MEETING HELD OCTOBER 15TH, 1869.

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THE following donations were announced, and thanks ordered to be given to the Donors:—

South American Whip and Bolas, by W. J. Smythies, Esq.

Coins, by A. P. C. Boevey, J. H. R. Clarke, and C. A. Sladen.

Painting on Talc, by A. C. Hilton, Esq.

Piece of Iron pipe almost entirely filled with Carbonate of Lime, by the Bursar.

Fossils from the Barton Clay, by L. W. Hinxman.

The Exhibitions were:

A mummified slow-worm, found when digging the foundations of the New House; and some celts, lent by the Rev. H. E. Booth.

J. B. Fuller passed round a list of Entomological Notices for September.

T. J. Verrall read the following paper, illustrated by specimens, on

## TEAS.

I do not intend this evening to give you a very accurate description of the tea-plant in Linnean botanical terms. We might no doubt find much instruction in a comparasion between Tea and the other plants allied to it, but I do not think my botany would carry me through there, and that would be giving a botanical lecture, not a paper on Tea; so I propose this evening to confine myself to the Tea-plant and those other plants which in different countries are used as substitutes for it. A great pleasure it would be to visit China, the home of a plant which is now so generally used, and so highly and deservedly valued throughout a large portion of Europe and far the larger part of Asia. But if I can shew you a little of the history, uses, commerce, and cultivation of the Tea-plant, I shall be satisfied.

First then to describe the plant itself.

The Tea shrub of China is a plant nearly allied to the Camellia. Its importance depends only on a single species, the "*Thea Sinensis.*" It is naturally 20 or 30 feet high, but when cultivated is rarely more than 5 or 6 ft. The leaves are from two to six inches long and the branches numerous. I tried to find some simple but comprehensive description of the flower, but was met by so many long botanical names, that I gave it up in despair, and must trust to other means for conveying to my hearers some idea of its appearance. The flowers are large, white, and fragrant, and have somewhat the appearance of a large briar-blossom.

Of the Tea-plant there are two recognized kinds, viz., the "*Thea Viridis*" and the "*Thea Bohea.*" Of this last there is a sub-variety called the "*Thea Stricta,*" but many people affirm that it is the same plant.

The places, where it first became known to Europeans, were China and Japan; it has now been introduced into Assam, Java, and also India. The plant must be regarded as naturally sub-tropical, but it can also live in hotter and cooler climates. In China it is thought by the natives to be indigenous, but it has probably been introduced there from the Corea, about the 4th century, A.D. From there its cultivation was extended to Japan about the 9th century, A.D.

Some say mention of tea is made as early as the first century of the Christian era in a book called "The Periplous of the Erythræan Sea" from which the following is quoted.

"But there used to come yearly to the frontier of the Sinoe, a certain people called Sesatæ, with a short body, broad forehead, flat noses, and of a mild aspect. They come with their wives and children, bearing large mats full of leaves resembling those of the vines. When they have arrived in the frontier

of the country they stop and spend a few days in festivity, using the mats for lying upon. Then they return to the abode of their countrymen in the interior. The Since next repair to the place and take up the articles which they left, and having drawn out the stalks and fibres they nicely double the leaves, make them into a circular shape and thrust them into the fibres of the seeds. Thus three kinds of malabathrum are formed. That from the larger leaf is called Macrosphœrum, that from the middling one Mesosphœrum, and from the smaller Microsphœrum."

This may refer to the betel-nut but many say it refers to tea.

The earliest place in which certain mention is made of it is in the writing of a traveller, by name Macpherson, in his "History of European Commerce." He says "tea is mentioned as the usual beverage of the Chinese by Soliman, an Arabian merchant, who wrote an account of his eastern travels in the year 850 A.D."

The next mention is in the time of the Jesuits by Maffei and Texeira (both Portuguese). Maffei calls it "chia" a Portuguese rendering of the Chinese "tscha."

In 1615 a Mr. Wickham wrote a letter to a gentleman of the name of Eaton in which we find this passage "send me a jar of the best chaw."

Olearius found it among the Persians, who got it from China by means of the Tartars.

Tea was first taken notice of by the Government of this country in the year 1660; when an act of Parliament was passed in which tea, coffee, and cocoa are mentioned.

Probably the Dutch East India Company were the first to introduce it into Europe. It was at first a very expensive luxury, £10 being the usual price for a lb. of tea. For instance, in 1664 the East India Company purchased 2lb. 2oz. as a present to the King. This shows the rapid spread of the use of tea. It seems rather ludicrous when we remember that an article, of which a lb. was at that time thought a present fit for a king, now transfers to the seventh heaven of delight some old woman at a village school feast.

The East India Company, through having the sole right of trade in that quarter of the globe from which tea was brought, at first realized a large profit by commerce in this plant, and their monopoly was often the cause of too little supply being made for the requirements of the nation. It was not till the reign of George III that any attempt was made to remedy this. Then an Act was passed which made it lawful to grant licences to other persons to supply tea, if at any time that supplied by the Company proved insufficient.

In the year 1657 the first shop for the retailing of tea was opened by a man of the name of Garraway. Tea has always been a taxed article of commerce. The duty laid on it has varied greatly. At first it was 5 shillings per

lb. After various reductions the duty (as at present) became 6d. per lb. In 1860, the importation into England was 88,946,532 lbs. The re-exportation was 12,087,104 lbs.

There are two sorts of tea, namely black and green.

It was for a long time the prevailing opinion that these were prepared from two separate plants, namely the *Thea Viridis* (green tea) and the *Thea Bohea* (black tea), but from experiments and discoveries which have been made of late, it seems probable that they are the same plant prepared in a different manner. For instance, Mr. Robert Fortune (a botanist who has visited China and made a personal inspection of the modes of growing and drying and exporting tea) says that in the province of Canton nothing is grown but *Thea Bohea* and in the province of Che-kiang nothing but *Thea Viridis*, yet both kinds are made in both these provinces. Again in Fu-kiang or Fokien, though nothing but *Thea Viridis* is grown, only black tea is made. This then proves that the difference is owing to the manner of preparation and not to the nature of the plant. I shall presently, in my description of the preparation of the leaves, give an account of the two methods by which the Chinese can produce either tea from either plant.

I shall now proceed to explain a few of the words which are used to denote the various qualities and kinds; words which are so simple to a native but are very confusing even to Englishmen, who understand the language. In fact they may be said to partake largely of the nature of private marks in an English shop (known only to the initiated). The truth is that many of the thousand and one outlandish names you find in tea-catalogues and inscribed on tea-chests are merely synonyms, used by the Chinese merchants for the avowed purpose of deceiving and cheating their foreign customers.

The word "tea" itself is derived from a Fu-kian word "tia." The usual Chinese word for it is "tscha" or "cha," which the English (as I said before) corrupted into "chaw" and the Portuguese into "chia." The Chinese make 150 names of subvarieties, which number is of course greatly increased in local and provincial dialects. A man of the name of Klaproth has written for the benefit of traders and others, who wish to become well acquainted with the real etymology and orthography of the Chinese tea trade, a sort of dictionary, in which he mentions 40 varieties as genuine, and for further security has given a literal (and I believe correct) description of the leading features which characterize each variety, both as to form, soil, and climate.

The following are the probable derivations of a few common names:—"Souchong" is a corruption of Songlo-tcha (green tea), which is so called from a mountain in the province of Kiang-nan. "Bohea" (black tea) is called so from another mountain Bou-y in Fo-kien; "Pekoe" (Pak-ho) or "White down" from the white fur on the sprouts or leaves of the tea plant in its third

year. The Chinese call black tea He-tcha, and green tea Lo-tcha. In English the specific names for green tea are Hyson and Souchong; for black tea the name Bohea is used. Both kinds are exported by the Chinese to a large extent, but green tea chiefly, as the Chinese drink but little of it themselves. The two great emporiums in Europe for the sale of Chinese, and to a certain extent of all tea, are England and Russia. To the latter is sent a great deal of the tea which is gathered when young, for this will not bear a sea voyage necessary to convey it quickly to England. We get chiefly the older and hardier kinds, and this is one reason why, though they do not import so much, the Russian tea is often found to be superior in quality to the ordinary importation into this country. We receive the tea much newer than it is drunk in China, for they consider it unwholesome to drink it before a year has elapsed since the leaf was first gathered from the tree, the peculiar astringent powers of the tea rendering it impossible to drink it when very new. Much of this power is taken from it by packing in the chests and conveying it to England. America also imports a large quantity, and they of course receive it by sea. Some of our re-exportation no doubt goes to America, but we also send tea to our various colonies, for it is now used by the British (both in Great Britain and the colonies), by the Americans, the Dutch, and the Scandinavian nations, who are very fond of it. In Austria and the German nations in general it is considered a powerful medicine rather than a beverage, and is now often prescribed by Austrian physicians for its astringent qualities. In other parts of the world it is only used by the wealthy, and has not yet become a sufficiently prominent article of commerce to render its consumption by the poorer classes possible. It is a great matter of doubt whether the large consumption of tea by the poor of England is not injurious in its effects. There is no doubt that it often does a great deal of good, but the arguments for and against its use I will tell you when I speak of the medicinal properties of the plant.

We now come to a very important division of my Paper; that is the manner of growing and the soils which have been found to suit it best. First then, the soil and situations in which the plant has been grown to most advantage. As a general rule the tops of hills or mountain slopes are best on account of the good current of air. There is one great thing which tea-growers have to guard against, and that is too much irrigation. Though in the rainy season streams run down the hill-sides and over the terraces, cut to sow the seed on, yet there is no danger of any amount accumulating at the roots. When such is the case the roots become rotten and the plant dies. Still instances have been found of the plant thriving in spots which must be always close and damp, and in the rainy season must be positively marshy. In the valleys the air is always too hot.

The soil which is most suitable is one of clay, with vegetable matter, which acts as a manure to propagate the very young plants; and as good a base as any is a sandstone conglomerate.

Though the cultivation of tea is carried on in nearly all parts of China, still the tea-farms are most abundant in the north. They are not and cannot be large, for the preparation of the leaves through the various processes of picking, roasting, drying, and packing occupies so many hands, and each of the processes has a separate building devoted to it. But one proprietor or company of proprietors often holds more than one farm, the management of which is carried on irrespective of one another by separate sets of workmen in separate sets of buildings. If the soil is rich enough no manure is used, as this greatly detracts from the perfection of the aroma on which, in the eyes of the Chinese, depends the value of the tea. Usually no difference in taste ensues, but the loss of the sweet scent is considered by growers themselves and also by many merchants to be a great misfortune. If however the oils is not rich enough manure of silk-worms is used, which are kept for the purpose by the owners of farms, and the manure is carefully spread over the ground.

The seeds are collected in the fall of the year, and carefully stowed away in sand till the following year. I forgot to mention that the earth must be very carefully drained, as too much moisture is fatal to the plants; yet the earth itself must not be too porous or the ground becomes hard and parched, but must be sufficiently porous to ensure proper drainage.

In the spring, following the winter in which the seeds are gathered, they are taken from the sand in which they are preserved, and the sowing commences. Holes are made in the ground at the distance of 4 feet apart. That is, the sets of holes are 4 feet apart, several holes being made close together, and seeds put in them so as to form a good-sized shrub. When the plants are once above ground they are seldom transplanted, as, whether owing to some peculiarity of climate or to the incapacity of Chinese gardeners and the inferiority of Chinese gardening, they never thrive well after they have been moved. The plant itself is an evergreen, but the leaves are not always in the same state of perfection, and so there is a regular season at which the picking takes place. The ordinary time for picking is just after the summer rains, when the new bushes are just beginning to burst into leaf. These are sometimes gathered when quite young, and from them young Hyson is made, which is very fine and delicate, so much so that it will not bear a sea voyage, but is exported overland to Russia. The sun-light and rain influence the tea greatly. For Powchong and Mingehew a bright sunny morning after the evaporation of the dew is required.

The usual picking is at the beginning of May. There is also a second picking, when, the leaves being older, the tea is not so finely flavoured, though

in some cases more powerful. There is also a third picking of the poorer produce. The leaves of this gathering are used by the peasantry of the country, but never exported. The later the gathering the more bitter the taste, and the more woody the nature of the leaves. This is one great test of the worth of tea, as the later pickings give out much less soluble matter when water is poured on them. It is well known that, strange as it may appear, none of the sweet scent or flavour of tea is found in the leaves when fresh. This is entirely the result of the manner of drying. It is also the case that the dryers can at will make green or black, good or bad, tea out of the same leaves.

We now come to the drying—that is the preparing, curing, and rolling of the leaves, which brings them into the state in which we see them in our English shop windows. I may as well say here that, as far as I can ascertain, the best books for explaining the mode of cultivation and drying of tea are Mr. R. Fortune's "Tea countries of China" and Johnstone's "Chemistry of Common Life." As there are two main sorts of tea, so there are two main modes of drying. There is also a division into the "wet" and "dry" modes of drying. This sounds rather absurd, but I will explain it presently.

First then of "Green teas."

They are made by roasting the leaves while still fresh in a hot pan for five minutes, at the end of which time they are moist. During this time they are stirred with bamboos. They are then taken from the pans and pressed into a Pyramidal form. In this state they are sunned for a few minutes, and are then opened. The leaves are dried, and the process is repeated. Then they are put into bags and trampled on, stored away in bamboo cases, and after some months spread out till soft. They are then rolled in a cast iron pan, inclined so that the leaves fall back to the rubber. This continues for an hour, after which they are taken out and sifted into three sorts in a bamboo sieve: or else they are winnowed, in the following manner:—the winnow is so contrived that the light dust is blown to the end of the machine and there falls into a trough, the young hyson, slightly heavier, strikes a board nearer the fan, and falls into another trough. The same takes place in order with the Hyson, Gunpowder, and large Gunpowder. The colour, such as it is, is then what is called "fixed." It is at this stage a dull green, but often becomes brighter afterwards. The Chinese, if they do not consider the colour bright enough, colour it artificially; but this comes under the head of tea-adulteration. The Chinese, as I have said before, drink black tea. For green tea great care must be taken to avoid gathering any of the stalk, and a little piece of the leaf is left for the new leaf to grow by.

The mode of preparing "Black tea" is as follows:—

Unlike the green tea, the leaves are allowed to remain spread out in the open air for some time after they are gathered, and are then made flaccid, not by roasting, but by tossing in the air. After that a pan, fixed in mahogany, is made red-hot and the tea is then roasted; three men are employed on each pan, one throws in the leaves, another stands over the pan with a cloth to his mouth to keep out the dust and fumes, rolls them about and brushes them out again, the third man receives the leaves in cloths or baskets. There is not a moment's rest, the three actions going on simultaneously. Another roasting is then given them, a lighted fire underneath the pan keeping it red-hot. The leaves are then pressed with the hands, are put upon square pieces of paper and dried for some hours over a pan of lighted charcoal.

This is the best way of preparing black tea. There are other modes which take less time and trouble, but tea prepared in this way is generally reserved for priests and for festivals. In the gathering of leaves for black tea far less care is needed than for green, as in the former case stalk and all is taken, in the latter only a portion of the leaf. It is not the charcoal fire I mentioned that blackens the leaves, but the long exposure to the air, the oxygen of which acts upon the juice of the leaves. It is thought by some people that the astringent principle in the leaves is favourable to the influence of oxygen but this in very doubtful. Many plants are used to scent tea, of which the chief is the "*Olea fragrans*," whose leaves are of the same colour as our field Cowslip and have a very sweet smell.

The "dry" and "wet" methods are so called from the leaves being in the former case dried without any previous wetting, and in the latter first dipped in hot water and then thrown into pans (half-a-pound to three-quarters of a pound in each pan), and kept well stirred to prevent their scorching. The rolling, which takes place when they are removed from the pans, is generally repeated several times. For black tea the dry method is adopted, for green tea the wet. The leaves are, I need hardly say, much diminished in size by the preparation (three pounds of undried leaves producing one pound of dried). The wet method diminishes the leaves most, and on this account the larger leaves are used. The Chinese are very careful that the tea should not be in any way rendered impure; the collectors are not allowed to use their bare hands but wear gloves, and before the picking are kept on very strict diet, not taking fish or any food likely to taint the breath. Teas, when they are flat, are, I believe, sometimes moistened and re-rolled. The teas when dried are packed away and exported in the curiously painted chests which we see. Though the foreign trade carried on by the Chinese merchants is very large, yet their home transactions are on a still larger scale. The amount of tea consumed by the Chinese is enormous; they keep it, not in wooden chests, but in

fine porcelain jars with narrow mouths for the sake of preserving the aroma they prize so highly.

We now come to an important question,—the adulteration of tea.

It was for a long time thought that this was the work of dishonest shopkeepers only, and that they made a trade of adulterating tea with various kinds of English leaves easily procurable, but it has now been clearly proved that the adulteration must be put down in a great measure to the Chinese themselves. They often colour it artificially to make a good price. At one time they even went so far as to own the fraud, and a company was formed for the sale of what were termed "Lie Teas," that is an inferior quality coloured so as to imitate a better. But it did not succeed. The reduction in price was not sufficient to tempt people to the wholesale consumption of artificially coloured tea. The tea is coloured by means of Prussian blue, gypsum, and indigo, (the latter is considered harmless, and is now generally used). The work of colouring is considered of great importance and to require great skill and care. The foreman of the works always pounds and mixes the Prussian blue or gypsum, (as the case may be), and then the workmen take the powder in their hands and rub it over the tea. For a long time the idea was entertained that the green colour of the leaves was due to their being dried over heated copper plates. But there is every reason to believe that this mode is never adopted. I am not at all sure that it would produce the effect desired. Here I will quote an interesting experiment from the book I mentioned just now (Johnson's Chemistry), for determining whether Prussian blue or indigo is employed. He says "if a portion of the tea be shaken with cold water and thrown upon a bit of muslin the fine colouring matter will pass through the muslin and settle at the bottom of the water, when the water is poured off the blue matter may be treated with chlorine or a solution of chloride of lime. If it is bleached it is indigo; if potash makes it brown and a few drops of sulphuric acid make it blue again, it is Prussian blue." The Chinese gather enormous quantities of leaves of other plants to mix with the true tea leaves, and these are put in whole or in dust. In both cases the requisite flavour of tea is given. In England sloe leaves are very commonly used for adulterating tea. Iron dust is also put in to increase the weight of the tea.

A few names given to tea by the Chinese may perhaps be amusing. For instance, of the Chinese teas we find Gunpowder, Pin's Head, Shanghae, Hyson, Mogun. These are all names of Green teas. Of Black teas, we have Flowery Pekoe, Scented Orange, Plain Orange, Souchong, and in Java a particular and rather rare kind called Imperial, in the shape of small round balls. The leaf of the best kind used for presents is called Cumshaw, and is either twisted and tied up like a cigar, or twisted up in paper balls.

The analysis of tea as found at the South Kensington Food Collection (on which you heard so interesting a lecture last half), is Water, Flesh-formers, Heat-givers, and mineral matter; but a more minute analysis is as follows:—Water, Theine, Caseine, Tannin, Gum, Sugar, Starch, Aromatic Oil, Fat, Fibre, and the mineral substances. Of these I will at once proceed to describe some of the most important.

Theine is an alkaloid found in both tea and coffee, as well as in other substitutes for tea and coffee. It has no smell; in taste it is slightly bitter. Though this is not a flesh-former, yet it is a flesh-preserver—that is, it diminishes the amount of waste that the body is continually undergoing both internally and externally. So it in reality nourishes in a negative way, for less food is required according as there is less loss of flesh and bodily tissue. If any one wishes to procure theine there is a very simple method which I have read of. Procure some tea leaves and put them either whole or finely powdered on a watch-glass and then cover them with a paper cone. If you then place the whole on some heated substance such as a hot plate or even a spirit lamp, you will see a white vapour rise gradually and condense on the sides of the cone in the form of minute crystals of Theine.

Caseine is the same element that forms the nutritious part of cheese, and is in fact named from that. In tea its proportion is about 15 per cent., but the whole of it is not extracted by the ordinary method of pouring boiling water on the leaves. A little Carbonate of Soda will help to extract the Caseine. The Tartars have an ingenious method of using up the whole nutritious portion of the tea. They collect the tea leaves and put them in moulds. To this they add salt, fat, milk, butter, and roasted meal, and then put water to it. This is what is called Brick tea, and is consumed by the Tartars to a large extent.

Of Tannin there is about 13 per cent. in common tea. It is this that gives tea its astringent power. To the Aromatic or Volatile oil tea owes its colour and flavour, and it is this predominating too much (combined with Tannin) that prevents the Chinese from drinking Green tea when very new.

Tea Substitutes are plants of which the leaves, fruit, or bark are used for tea in countries where tea itself is not cultivated. They may be divided into two classes. I. Those with Theine. II. Those without it.

Of Class I, I will mention four of the principal.

I. Maté or Paraguay tea. This plant is not, as was once supposed, the *Ilex Vomitoria* of N. America, but the *Ilex Paraguanensis*, a small shrub about the size of an orange-tree; in fact the *Ilex Maté* of St. Hilaire growing wild in Paraguay. The Spaniards call it "*Yerva maté.*" It is not cultivated, but negroes are hired by merchants to pick it off the wild trees. The branches are cut off and dried on heated turf. There are three different kinds—namely,

Caa-cuys, the bud of the leaf; Caa-mini, the leaf torn off from the trees, and not roasted; Caa-guazu, the whole leaf and small twigs roasted. The *Ilex Vomitoria*, a plant of the same nature, is used to purify water. Francia, in his governorship of Paraguay, forbade the use of Maté, and a Brazilian plant was used for it, but it did not succeed so well.

II. Guarana. A plant used in Austria and France for the purpose of extracting Theine as a medicine.

III. Coffee leaves. The unpleasant smell of these leaves prevents their more general use. They are chiefly used in the West Indies.

IV. The Kola-nut. About this nut a paper has been written by Doctor Daniell. He says:—"It is sold in Central Africa, where it is used as a medicine by white settlers." He first discovered its properties by the insomnia which resulted from a draught of it. Negroes are very fond of it, and it is in many places grown for their use. When mixed with impure water it renders the taste agreeable.

Of Class II. there are the Siberian, Apallachian, Labrador, Chilian, Trinidad tea, and the Partridge-berry of N. America. The use of these is not sufficiently general to make any account of them worth while. Sage leaves are also used as a substitute for tea.

The tea substitutes of Mauritius are sufficiently numerous to deserve special mention.

I. Culen or Koulin, a plant used for poultices and as a remedy for asthma and oppression of the chest. The leaf is also smoked like tobacco.

II. Faham, used for medicine. M. Fleurot says:—"The crystals are in small groups of rectangular prisms, which are soluble in boiling water, and much more so in heated alcohol or ether."

III. Jamaica Vervain. This plant is sometimes sold as Brazilian tea.

IV. Thé du Mexique.

V. Citronelle or Lemon Grass. Really a native of India. It is used as a remedy for sickness. It is often cultivated in Botanical gardens.

VI. Capillaire. A fern which grows in dry rocky places. Bernardin de St. Pierre, in his "Paul and Virginia," the scene of which is laid in the Mauritius or Isle of France, often talks of "Capillaire." Whether he knew it as a tea substitute or not, I of course cannot say.

There are two more plants which from their relation to tea I must mention.

I. Salep. The root tubers of several species of orchis are used. The younger of the two root tubers is gathered, when the stalk is about to fall. These tubers vary from the size of a cherry to that of an olive. They are cleaned and peeled by dipping in hot water, and the brown skin is rubbed off with a cloth or brush. The tubers being thus cleaned and peeled, are arranged on a tin plate, and then placed within an oven, heated as for

baking bread. Here they are to remain for seven or ten minutes, in which time they will exchange their opaque and milky whiteness for a semi-transparent horn-like appearance, and a yellowish colour, retaining their original bulk. Being then withdrawn from the oven, they are exposed for some days to dry and harden in the air, or by the employment of a very gentle heat they may be brought to the same state in the course of a few hours. All that is then required to adapt the Salep for food is to boil it in water (or milk) to the required consistency. (Library of Entertaining Knowledge).

The ordinary genus is *Eulophia*, but nearly every European orchis can be used. About 30 years ago, before coffee became general, it was sold of a morning to the working classes of London. It is still used in France.

II. Sassafras (*Lauraceæ*), This plant grows in N. America, but is there merely a bush. In S. America, however, it grows to the height of 50 feet. The wood is soft, light, coarse in fibre, in colour dirty white or reddish brown, of a strong but agreeable smell, and of a sweet taste. The wood is used in chips, mixed with the root, which is very strongly flavoured. The bark is used as a medicine for gout. It also makes capital mucilage for thickening soup.

Several attempts have been made to introduce the tea plant into other countries, and of these I will mention one or two.

It was about the year 1836 that the tea plant was first cultivated in India, chiefly in the two provinces of Kumaor and Gurhwal. In Mr. Fortune's account of the valley of the Deyra in Kumaor, he says :—"The soil of the valley is composed of clay, sand, and vegetable matter, resting upon a gravelly subsoil, consisting of limestone, sandstone, clay-slate and quartz rock." This valley seems to present features the very opposite to those usually considered favourable to tea. It is flat; the air is very hot and the ground very wet. In Guddouli in Gurhwal the tea will grow, but not so well as at Deyra. Still there seems a strong probability that some day we shall get much more tea from India than from China, as the former is much more accessible.

Attempts have also been made in Ceylon and S. Carolina. Here the soil seems to be good but there is a lack of good workmen. It has been thought that the slopes of the Himalayan mountains, on account of their varying elevation, would be suitable, and it has been further suggested that the plant might be cultivated to advantage in the S. of Africa at the Cape of Good Hope.

In Assam the natives eat so much opium that they are too lazy for work.

Medicinal properties. The nature of tea is at once stimulant and sedative, and it also possesses great astringent qualities. It may be used as a stimulant, but may also be given moderately in cases of restlessness. It is not alcoholic but no doubt excess in tea drinking produces a thirst for alcoholic drinks. It is a good antidote to opium and has often been used with success in cases of poison-

ing. By some medical men it is recommended for fevers and heart disease. It is very much like coffee and cocoa, in fact the analysis I gave just now is also the analysis of coffee and cocoa, and for this reason cocoa is often recommended when coffee and tea do not suit the constitution.

In conclusion I will quote Jonas Hanway's amusing remarks against, and Dr. Johnson's for, tea.

The one says. "Men seem to have lost their stature and women their beauty. What Shakespeare ascribes to the concealment of love is in this age more frequently occasioned by the use of tea.

The other, in the *Literary Magazine*, describes himself in the following words.

"A hardened and shameless tea-drinker, who for twenty years diluted his meals with only the infusion of this fascinating plant: whose kettle had scarcely time to cool; who with tea amused the evening, with tea solaced the night, and with tea welcomed the morning."

I must thank all my hearers for the attention they have given me and the President in particular for the loan of his specimens without which I could have done but little.

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There were 72 persons present; 1 Hon. Member, 28 Members, and 43 Visitors.

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## MEETING HELD OCTOBER 29TH, 1869.

THE following donations were announced, and thanks ordered to be given to the Donors:

Ammonite, and Indian Corn, by H. T. King.
Pendent Wasp's Nest, by F. Head.
Butterflies *(A. Paphia, &c.,)* by G. E. Manisty.
Death's Head Hawk-moth *(A. Atropos)*, by the President.
Two Greek Coins, by E. W. Swetenham.
The first Report of the Wellington College N.H.S., by the Society.
"On the Teaching of Physical Science in Public Schools," by the Author, Rev. W. Tuckwell.

W. D .Fenning then read the following paper, written by J. F. Cornish, on

## TORCROSS, (DEVONSHIRE).

AT the commencement of this Paper I must apologize to all for the absence of Natural History in it; my plea for this omission is ignorance, ignorance of Natural History generally, as well as ignorance of any particular branch, but having heard and profited by so many interesting papers in this room, I should hardly feel justified in leaving the College without trying to tell you something and interest you in some measure; and may you pass kindly criticism on this my attempt! The spot about which I shall tell you to-night is a Hamlet in the extreme south of Devon, situated in Start Bay, at equal distances from a point you may see in an atlas—Start Point Lighthouse—and an inconsiderable headland called "the Mew-stone": in case this bay gives you no idea of the position of Torcross, let me say that the Start Bay adjoins a bay of some celebrity in history and fame, for its beautiful scenery and formation—Torbay. There is no railway station nearer to this gem of a place than Dartmouth, a distance of eight miles, and this is, to me, a great recommendation, for besides being out of the way of smoke and objectionable hangers-on to a train, one has no temptation to move thence in the course of a whole vacation, so much so that though I have spent eighteen summers there, I have only once slept more than one night away from my accustomed abode. Until some six years ago there was no rail within sixteen miles, whether halving that distance was an advantage or not, I leave for others to decide.

I fear when I once enter on the subject of Torcross I shall not only attempt to describe the nature and peculiarities of the place, but that I shall "twaddle" on about manners and men and in fact about everything that interests and strikes me about it, and by so doing I hope to stir up a desire in those of you who inhabit the west to make a little tour to this spot; if you do this on the strength of the paltry recommendations publicly given here, your troublesome journey through beautiful country will be amply rewarded. If you cannot possibly feel interest in it pity and perhaps pardon me for supposing that you could. Thence did I come to begin this Half-year, and I hope that I may be able to impart to some a portion of my knowledge of and love for the place, since certainly increased familiarity has not increased my contempt for it.

This Hamlet is close by the sea, a veritable sea-side place, and, naturally, its inhabitants are fishermen, the population, however, is not much above two hundred, so little is true merit appreciated.

To begin with the sea, which must in such a spot be the leading characteristic; it is of the usual greeny-blue colour, but is distinguished from its nature at adjoining places by being being beautifully clear; some here may

have followed the South Devon line as far as Dawlish or Teignmouth, where the sea has by no means the recommendation of clear transparency, which it possesses in Start Bay. Those who see it in the summer have not the best opportunity for observing this clearness, for annually, in July or August, the sea in that part, as the fishermen express it, "*clan'th* itself." Whether this process takes place annually at other sea-side places I have not enquired, or what is the explanation of the change that comes over its clear water, but in quite calm weather about the time that I mentioned above, lines or banks of sea-weed appear near the shore in regular lines, of which perhaps there are three within sight of the shore; this is objectionable for bathing, for seaweed, if pretty to look at and talk about in poetry, is by no means pleasant stuff to cling to one's body and impede arms and legs, and of course with the usually hidden weed comes up much foul stuff that quite spoils, so to speak, the sea's complexion; this annual attack of jaundice lasts some two or three weeks and leaves the sea more beautifully clear than before, which is some compensation. One would imagine such phenomena to be merely the result of storms, but the other day I could trace this annual attack to no such cause, and I could call the process by no more true, if more refined, word than the "claning," of the fishermen.

The distance from the focus of my description, Torcross, to Start Point is, by water, some three miles: some four miles of rugged roads but romantic and beautiful scenery, conduct the traveller thither on foot: to ride or drive thither is a physical impossibility for man or beast. To the celebrated, secret, Dartmouth Harbour the distance is some six miles by sea; the entrance to this harbour, I must explain, is as it were a "slit" in the rocks that skirt the sea between the "Mew-stone" and Torcross, which has the advantage of making the Harbour a very hidden one, perhaps, indeed, rather too much hidden for vessels that under stress of weather yearn to make the harbour. The tides in this bay are most convenient for bathing purposes, for instead of, as is the case at many places, the tide running to the shore and from it, it runs up and down, that is, towards the Mew-stone when it flows and towards the "Start" when it ebbs, so that in swimming out to sea the bather need not fear the adverse run of the tide for his inward course, but finds each way equally easy; in fact, except in Spring tides, the tide makes very little difference in the position of the swimmer either in the upward or downward direction. The only point at which the tide is in any degree powerful is round Start Point, where it runs, I am told, at the rate of eight or twelve miles an hour: I can say from experience that to be in a small boat with only one companion just off the promontory and trying to pull against the tide is anything but an enviable position: in fact it makes one feel rather small and feeble, for the tide besides running against the boat carries it at a good pace

though almost imperceptibly out to sea, and should not the rowers be tolerably expert, the tide will not leave the boat till it had been whirled some mile or so out to sea where the tide is less furious and powerful.

Just on the other side of the Start is *Prawle* Bay, which is rather a pet place for wrecks; the vessel that, when the wind is inshore, gets into this bay never can beat out again, but, after some dire struggles, is dashed upon the grim rocks which always look ready to grind anything and everything to powder. Since the Start Lighthouse has been erected I suppose about one wreck a year has been the average, but before that! well, I cannot say, for I was not alive to tell the tale. *Apropos* of wrecks, nothing can be a better "spec" for the poor fishermen, who, though scrupulously honest as a rule, pick up and carry off all the things they can: their idea is, that if they don't take the things the Preventive Officers will, and keep them too, so of this they hardly see the point, but, going at night, get all the things they can and, rushing home through wind and rain, bury the spoil in their gardens or some adjacent bit of ground, so that when the Preventive, or Custom-House officers make search in the house, they find nothing. The annual wreck came off last February, and in consequence when I was in my usual haunts in the holidays, I saw in almost every cottage some remnant of the wreck—this was a "*wrack*" handkerchief, that a "*wrack*" pair of boots (for luckily the ship having a general cargo, each one's wants were supplied). It was regarded as a general grievance that the sea and rocks had somewhat spoiled the articles. Some years ago a Russian ship "the Daniel" was wrecked, and a woman feelingly told me that "she did'nt know what they should all have done if it hadn't been for th' old Dannull." The same person, by the bye, was much scandalized, because though there was a *pig* on the Russian ship, the sailors did not call it a *pig* but had some "furient" name for it.

It is possible to fish from the shore for conger eels, bass, etc., and almost possible to catch a few; a long line is obtained and a lump of lead attached to one end, whence go two hooks tied on to smaller gear; a loop near the lead is seized and whirled in the air and sent flying into the sea at a distance of some 20 or 30 feet: caution must be used, for a friend of mine caught the hooks into the fleshy part of his person and thus caught himself; the knife had to be resorted to and the hook extracted.

Having thus as it were come in from the sea let us look at the beach and see its nature: it is remarkably shelving that is to say there is by no means a gradual decline from the ridge of the beach to the water, but so sudden that bathing in the sea, clean though it is, is not very enjoyable unless you can swim, for the scope of action is very limited, three or four slips being enough to take the bather hopelessly out of his depth; but I must not forget that, from

the age of about five to ten, I used to enjoy my bathe as much as anybody, although swimming was then, naturally, a delight unknown to me, and it is clear that more than two slips then would probably have carried me to a watery grave. How I managed to teach myself to swim there, I know not, but as such a problem is not of universal interest I need not here try to unravel it. Another disadvantage resulting from the steep nature of the beach is the difficulty, which the men experience in pulling up their boats, which, though by no means large, require six or seven men to drag them out of the way of the tide when they come in tired from their day's work: perhaps an account of their day's work may not be altogether uninteresting: their day begins at different times according to the time at which the tides serve for the outward voyage, but it is something between 12 p.m. and 6 a.m. generally about 3 or 4 a.m. The boats are launched—the bait and lines being ready—and off the little squadron of eight boats goes: they generally sail and anchor in company for safety's sake: there are various fishing grounds; one about ten miles distant, the others less: they anchor at the spot for some five hours and then sail in again: men with carts are ready to buy the fish and carry them over the country for sale—these are the 'Chow-ters'—the derivation or meaning of the word I am ignorant of.

After a nutritious meal of bread soaked in hot water, flavoured in prosperous times with an onion or carrot, the men go to bed, where they sleep an hour or so: they have a frugal dinner and then 'dawdle,' collect in groups which resemble Quakers' meetings, as far as any conversation is concerned: it is a splendid sight to see their tanned, grim features clothed with an expression of mystery: often have I, seeing the fire thus kindle, gone up expecting to hear some wondrous theory propounded or philosophical question put, when, after a few tobacco-puffs, some mild and sphinx-like remark about the weather has been the only result of all the cogitation and contortion. About four or five p.m. they go in large boats, about eight men in a boat, to catch bait, which they call "Lants." This name, I believe, is peculiar to the bay, but they are the same sort of thing as sand eels, and I am sure I admire the good taste and acute palates of the fish, for the Lants certainly are very good: a net is thrown out not far from the shore and the men, assisted by the women (who are in a state of "*squaw-like*," but happy, subjection) draw it to the shore.

I must add that their submission is, so to speak, physical: they do the hard and dirty work and have to trudge a long way to the "hauls," while their husbands row; but they, as a rule, keep the purse, manage all household affairs, study domestic economy with painful accuracy, and always "play the Aaron" when visitors and gentlefolks come in: the men are reserved, sheepish, and oracular—in fact almost dumb before strangers: and it is only upon acquaintance that the splendid simplicity and strict morality of their ideas comes out.

After some three or four "Hauls" enough has been got, as a rule, for bait and some for sale: the bait is divided among the men, the nets stowed away and home all come: the men, after their second salt-drenching for the day, have completed their day's work and can go to bed as soon as they please: they do not please, however, till about nine or ten o'clock and then in a few hours their day begins again. Sometimes I have returned after unwonted dissipation at about 12 or 1 o'clock and seen the boats in the dim moonlight going out to sea and the pretty sight has given a gentle rebuke to my late hours, for here are these men who have worked hard all day beginning their day when I am ending mine: I am afraid however this thought has not driven away sleep. The accidents that happen to these boats are few and far between, for being so small they seem to stand in danger, but for the last four years there has not been one. There is a larger sort of boat used for a different purpose a "drift boat" which is manned by three (while the smaller is manned by two) partners. The "drift" boats carry nets, drift-nets, whence their name, and go off in the Autumn to a distance of some miles to try for pilchards which ought to 'mesh' in the nets as they drift astern of the boats with the tide: the mesh being of an ordained size, the smaller fish pass through: in good seasons the profits are considerable, one boat catching some thousands a night: those that cannot be sold are "salted in" for home consumption and sustain the families during winter: the life though, when from home, is very rough, for they sleep anywhere or nowhere, since the boats are too small to sleep in comfortably and the men have not money enough to go to an Hotel.

Besides the "Hooking" boats and "Drift" boats, there are "Seine" boats, which are longer and stronger, and are used for the purposes of net fishing, either for Mackerel, which appear more or less in July and create great excitement in the village, or for a general cargo, so to speak, of fish, with a net, called an "Inch-net": on such an occasion the boat goes some mile or so from the land and encloses in its net a most incongruous assembly of finny creatures: these nets take some long time to be hauled in, two hours or more: I doubt whether the fishermen are rewarded for the trouble but spectators certainly are, for the most unearthly specimens appear: all species of shell fish, sea-pigs, and all manner of edible and inedible fish: and what is better fun on a slight scale than to hear the simple but bombastic remarks of Cockneys who happen to be lodging near the scene of action? How they startle the "natives" (not oysters) by their remarks indicative of ignorance surpassed only by bombast. And while I enumerate the greatest oddities to be seen in the "motley crew" of fishes shall I forget thee, O cuttle, that lookest so innocent and harmless, till some white-waistcoated visitor takes thee up condescendingly, when with one mighty effort thou contractest thy muscles and in an instant sendest a mighty stream of thy own peculiar ink over that erst

virgin waistcoat? Oh, the inimitable look of pity and contempt then depicted on the faces of the natives! If by thy squirts and fliks, O cuttle, thou hast made an enemy, thou hast made one that will never molest thy inky tribe again. It is interesting to know that these murky creatures are provided with back bones which have the peculiar quality of ink-erasing: so that if you are but polite to a cuttle-fish it may perchance present you with its elegant backbone in order to remove the stains which its trifling ebullitions have caused before.

On Sunday evenings may often be seen a line of backs appearing at intervals on the surface of the sea not far from land: these are the porpoises playing "leap frog" or "leap-porpoise" for a joke. It is strange that these creatures should appear on Sunday evenings, but I have remarked this to be their favourite day. I suppose they are religious and after having had puritanical sermons, their minds require recreation which they obtain in this game of leap-frog: some people say that they are harbingers of wet weather, others, of gloomy weather, but I should say that they are as much harbingers of the next day *i.e.* that the wet or stormy weather is not more accelerated or caused by their frolics and gambols than the advent of the next day is.

In the winter there is sometimes oyster dredging, but of late years this pursuit has hardly repaid the trouble. By the shore, partly exposed at low tide are the "limpet rocks," so called from the plenteous covering of that creature: there is plenty of weed about them and holes worked in the rock by some means which now serve as houses for crabs—proper, edible, red crabs; to catch, or try to catch, these is no bad fun; they creep to the end of the hole, sometimes several feet long, at high tide and there abide till the water is about to leave the hole: the weapon for catching them is popularly called a 'gaff,' a stick about a yard, long armed with a large barbed hook which is to be inserted into the hole. If a crab be there it is probably hooked out in a few minutes after losing a claw or so: let me however warn all against being as foolhardy as I was at the early age of ten.

I had heard a great deal about these crabs, how good to eat and hard to catch, and had seen some caught, and, thought I, why not I as well as others? So off I went, found one in a hole, of tolerable size: one rather important part I had forgotten, a 'gaff': however I put in my hand, but instead of my catching the crab, the crab caught me in the middle of my right hand with one of its big claws; the hole being large, I pulled the creature out as it hung on my hand, and tried to shake it off: that however did not 'pay' at all for it clung the tighter and gave good promise of making its pincers meet in my palm. I was helpless for my right hand was incapacitated and my left very weak: I should have had to walk home some half mile in pain with this parasite had not a herculean gentleman been there, who with some difficulty

released me. Well I remember my dastardly revenge on the brute which I thought very plucky: the skin of my hand was broken and the blood running and to this day have remained the marks to remind me to take some implement when intending to get a crab. I have heard that a man on these same rocks was as foolish as I was and less lucky, for he got his hand and arm deep into the hole and was there detained by a crab. The water rose and there he was almost afloat and in some pain, when just as he was about to get a knife to try to saw his arm off, and thus escape, leaving a feast for the crab, that creature kindly let him go. But if I detail such horrors I shall quite spoil your night's rest with phantoms of creatures that enjoy eating you as much as you enjoy eating them. The adjoining hamlets to Torcross supply London chiefly with crabs, which they catch off the Start in crab-pots. Few perhaps have seen a full-sized crab, certainly never in Mr. Harraway's shop, where the largest are mere pigmies, though very likely to be as expensive as the full-grown produce of Start Point, which cost 2s. or 2s. 6d.

I feel that in giving these odds and ends I may be accused of laying down the law in these matters and addressing you as people who are quite ignorant of these things: but Torcross is such an out of the way place that a few things I may say about its customs and its inhabitants may be as little generally known as things done in "Ultimis Gadibus" or the Island of Patmos. The crab-catching is carried on by the fishermen of two adjoining Hamlets, which are near the Start Point. Some few may not know the look of a crab-pot, and as it is simple and efficacious, perhaps I may try to describe one and explain how it acts. It is made of wicker work and stands about two or three feet high: a hole at the top and a neck inverted as it were, so that, though nothing is easier for a crab than to get in, it is impossible to get out. In these pots are put slices of dog-fish and the more inferior sorts of fish, raw of course—yards and yards of rope are attached sufficient to stretch from the bottom of the sea where the crabs lie (always on rocky bottoms) to the surface, several corks, of the size of a Kennedy's Latin Grammar, float attached to the rope at the top of the water to show the spot where the crab-pots lie: some are three miles out to sea, at or near Start Point, and some at a far greater distance: these have to be visited every day to remove the crabs already caught and to change the bait: the crabs are then brought in and put into a pot which is quite near to the shore, where the crabs can stay and live till required for the neighbourhood or for Billingsgate, for, as I said before, the greater part of the London crab market is supplied thence. As coals, perhaps, are hard to get at Newcastle, so it is very hard to obtain, for love or money, crabs at this place where they are caught *by thousands*, as the London market makes a large demand. Of course all know that crabs must not be allowed to die: that is to say, they must be killed and boiled almost immediately, or, if compassion for the stolid representative of the

shell creation is not in your composition, let the boiling water bubble the creature's requiem. At the end of the week these creatures are packed in hampers and sent to Dartmouth by cart and thence to London by rail. The crab trade would be very lucrative were it not for the losses sustained in rough weather, for when the storm comes suddenly, the sea carries off the pots before they can be brought to land and dashes them to pieces on some shore or throws them in the way of a channel ship, which picks them up. As a daily visit must be paid to the crab pots, these boats, which are no longer than the Torcross boats, have sometimes to face dreadful weather or resign themselves to the loss of their source of livelihood. Fortune with her eyes wide open seems to protect and preserve these cockle-shells as they toss in a storm: they are always on the move, for there is no need of anchoring for the few minutes stay, which suffices to pull up, examine, and re-bait the pots.

Going from the beach we come to the rocks, the cliffs, which are formed of blue slate veined with quartz. They give the idea of being "everlasting hills" as compared with the crumbling sandstone cliffs which surround Dawlish and the adjoining places, which the traveller passes on the South Devon Coast Railway. Though perhaps quite unintentionally, they give one the idea of being on the point of toppling down on the train and passengers as they pass. Near Torcross, in the days of the ancient Romans, an attempt was made to quarry for the slate: some progress was made and the attempt was given up: after some years or centuries attempts have been renewed at intervals and continued until a late date: all failed from the difficulty of carting or conveying the slate away. Two gloomy, stagnant pools, are the only result: in fact the cliff is disfigured greatly by the late excavations, while the cuttings made until quite lately have been covered with verdure green and brushwood, and look rather grand. This same quarry is a grand place for rabbits and Jackdaws or '*Chalks*,' as they are called there in imitation of their hoarse utterance.

The great peculiarity of the place Torcross is that the sea is separated from a fresh water lake, a ley as they call it, which runs almost parallel to the sea for two or three miles: this is the "Slupton Ley," which is famed for the quantity of fish it contains, but not for their quality: Pike, Perch and Roach abound, but in the summer the water is so low that mud is the distinguishing feature of their taste and their condition is poor, owing to the quantity of mouths, and paucity of material to fill them. The Pike are of an enormous size, but hideously coarse to the palate. A narrow belt of sand, about 150 yards wide, separates the two, and in the winter the high winds drive the sea into the ley and kill many of the fish—rather a mercy! I believe that in one other place there is a like phenomenon, but I know not where. In the winter when the sea is high the cottages are in great danger, for though rustic cottages, according to poets, ought to be strong and neat and in good repair, most of these are

"tumble down" and a tolerable wave might obliterate them. The sea, for a joke, sometimes bursts a door open and fills the kitchen with a foot or so of water—a foot deep, I mean. Occasionally the inhabitants have to escape by the back way to avoid a death by drowning, for, strange to say, hardly any can swim: chiefly, I suppose, because there is great need of it. May I be pardoned for inserting a characteristic speech of an old woman of 70 something, who told me the saying herself with great gusto. A grandson came to take her out of bed, on one of these stormy nights when the cottage was in danger: and in reply to his petition she said: "Now: 'ere I be, and 'ere I'll bide: and if the Loard plaisth to knack down the house, let'un knack me down with 'un, and there *us'll** all be togither." These are her words which may need a translation to non-Devonians. She said, "*No*: here I am and here I will abide: and if the Lord is pleased to knock down the house, let him knock me down with it, and there we shall all be together." Of course the beautiful pathos of the sentiment is quite lost in the '*construe*' so to speak. It is almost needless to state that these people are quite uneducated and cannot imagine how much their children will lose by being educated. The rich vein of mother wit that most of these uncouth beings (especially the women) have is quite astonishing: and a woman, who gravely told me that some place was destroyed by some folks they called the Danes nigh two or three hundred years ago, would create considerable laughter among any but the most stolid and astonish all by her wondrous insight into character and keen appreciation of the ludicrous. Now that I have wandered so far I might as well add a few more genuine Torcross sayings: A French ship some years ago had run ashore at Torcross: the authoress of most of these sayings, and of many which I forget, complained of the indistinct gibberish of the sailors on board the ill-fated ship: I apologized for them saying that they talked French, a language which she could not possibly understand or speak: She looked incredulous: I suggested again that she was an unfair judge, for she could not speak French—"Oh but" said she, with a knowing grin and unconscious cleverness, "You see, I never tried"!

Being uneducated, each has the charm of perfect originality, whereas their children will, I fear, be servants etc. and all painfully alike morally and intellectually as well as physically. The dire effect of education is beginning to be seen already: the children are very "uppish" and finely dressed, and refuse to fish as their fathers fished before them, and the consequence is that the number of "Hooking boats" has gradually and is still gradually diminishing. The children, I believe, think that trade is the great thing as that may get them to London, and in London all must be rich. In the winter, when the

* Who the US'LL ALL is, is not apparent.

sea is too rough for any sort of fishing, the men have to degrade themselves to stone-breaking, etc., for naturally the farmers do not want men in the winter months, when little is to be done, who cannot work for them in the busy days of harvest.

How they live I cannot tell, and were it not for some good Samaritans they would not live to tell either. Unless there has been a good Pilchard season, bread, hot water and old tea-leaves form their staple food, and the wife of a man working on the roads told me that he earned 10s. a week and that the bread bill each week for the family amounted to 8s.: so luxuries and almost life are out of the question. In a winter a few years ago great misery prevailed, the family of an old friend was in great distress, and death from starvation seemed imminent, and the woman, conscious of her own integrity, felt inclined to rail at Providence: the way she expressed her feelings to me afterwards were splendid: "Oh well! 'twas shocking times! but there you see we got through it! well there's one thing I've often mistristed the Lord afore, but I'll never mistrist 'un any longer"! Comments on such a sketch of primæval morality would be needless.

Further and further must I wander: *apropos* of French, I may tell a story which has probably never travelled from Torcross to Marlborough: an old gardener was taking a friend of mine round a garden and came to the flower commonly called "Dog's Tooth," the gardener, proud of his Latin lore, said "Yes 'tis called Dens Canis," and volunteering a construe, added Dens Dog Canis tooth Dog's tooth: this story was repeated to an old lady as a joke, who, in an apologetic voice, excused the old gardener by saying "Oh you see the poor old man never learnt French"!

But really I have wandered a vast way from Natural History, as I was afraid I should when I took this subject in hand. Now let us see how each branch of Natural History is represented in South Devon. I began the last holidays with the full intention of getting a collection of sea-weeds (which grow in great profusion on the Limpet Rocks) and of keeping an aquarium, and so procuring a quantity of pickled sea anemonies to present to this Society, but you only, who know what resolutions for activity each of us makes for the summer holidays and each time deceives himself, can pardon me for coming here again empty handed, without sea-weed, sea creatures or moths, of which there are certainly great quantities. I am not entomologist enough to say whether they are all alike or whether there are some rare sorts: nature is so kind to Devon generally that she most probably has not been stingy with moths: my idea was that in these last holidays I should go to Devon, provided with net and boxes and pins and *hoc genus omne*: but alas! I forgot all this at the right time and so, thus unprovided what could I do! for the place is so out of the way, that nothing can be got with ease. Butterflies are certainly

very plentiful in the lanes but somewhat monotonous, for there do not appear to be many kinds.

As to Botany, this region is wonderfully provided with flowers, which I admire but cannot understand and describe: those who may happen to have seen a book on this subject, of good apearance and good matter, "Flora Devoniensis," will see the vast profusion and variety.

Ornithologists will have little to do or admire in South Devon: Yellow Hammers, Sparrows, Blackbirds, and Water Wagtails are the only birds that appear at all often, especially the latter, which swarm on every lawn. Paucity of trees may account for this deficiency and also the relentless persecution of the farmers, who kill off the birds under a mistaken notion that the birds destroy the trees and crops.

On Archæology I might have tried to lecture, or rather give hints on this subject, to night, but after Fenning's lecture on Coins and Archæology generally, such an effort would be absurd. In the last winter after the storms, on some sand near Torcross, a few gold pieces were picked up: this provoked search and a good quanity were found of some two or three hundred years old: the strange thing was that they were as new as if they had been struck at the mint the day before; it is supposed that a ship laden with chests of *bullion* was wrecked here years ago: that these chests remained stolidly at the bottom of the sea buried in sand until these storms, joined to a peculiar tide, washed off the sand, burst the chests and sent up the *coins*. I did not hear of this directly, being in the north, but on being told of this "find" and being a Collector I wrote off directly to a fisherman begging him to keep all he could find for me to inspect and buy: he found several, but I suppose good offers were made by Connoisseurs and the absent candidate was forgotten.

I hope that people will not think that I am anxious to tell of my great deeds, but I played a part in a chase which may form an interesting fact in ornithology. At Torcross one day at the beginning of the last holidays, from our house I saw what appeared to be a 'diver' in the sea; someone however told me that he had heard the "whirr" of a pheasant passing over the house and that it had fallen into the sea. It was evening, so that I could hardly see what it was: taking its pheasantism for granted, I set off, knowing that it could not rise from the water although it would be a good hand at swimming: I seized a towel, ran off, got to the water and swam out some fifty yards to cut it off. The bird was evidently out of its element, with a vengeance, not being accustomed to sea-water, or to me in the water; seeing, that is to say, a fearful head, it swam very fast for a bird, and I swam very slowly for a human being, but overtook it; as I approached, it looked alarmed and uttered its last "crow:" I seized it by the neck and held it under water for several minutes—its wings beat me unpleasantly at first but when it became

more quiet I swam in with it when I discovered it to be a fine, good-sized cock pheasant. I kept tolerably quiet about it, since it was out of season; but it tasted none the worse for that. I think a case of poaching could hardly have been made out, as I certainly was on nobody's ground, however no one tried to make out a case, so I cannot tell. A fortnight ago a man wrote a letter to the *Field* saying that he had caught four partridges in the sea, but accounted for their presence there on the hypothesis of their being fatigued: I sent an account of my experience (which was too late for insertion), and gave it as my idea that the birds do not see the nature of the water till they are so close as to be unable to escape: once there, of course they are "done for," as the pheasant of my acquaintance was.

The great event of the year is the regatta which comes off in the summer, August or September; it is a day of gaiety and shows and filth, which makes great havoc in the quiet village. The sailing races are much as they are at other places but the quiet and vegetable existence of the men is shown by the fact that three or four boats enter for the rowing prizes, and "to avoid extra exertion" they arrange beforehand to divide the prize-money for the several prizes equally, whichever boat proves the victor: this dislike of exertion and want of jealousy, or even emulation, are charming characteristics.

I must pray forgiveness in conclusion for the absence of Natural History, properly so-called, my excuse I have given before. This paper is a mere disjointed collection of points, well imprinted on my mind, about the place and the people, of which the recollection is to me pleasant: I only hope here and there among the rubbish some odd and end may strike you as news, and that you may feel to have a distant interest in the fortunes and manners of these inhabitants of "Ultima Thule" and a desire to see, what from my description of it perhaps you would hardly guess to be, one of the most lovely little places in England: my experience of other places is so limited that I should not dare to say this except on the authority of those who in the course of long travels have happened to light upon this little gem set in cliffs and sea.

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E. Meyrick and G. H. Perry were elected Members of the Society, and L. W. Fox, H. B. Steel, C. F. de Jersey, and W. C. Adams, were elected *Medii Socii*.

There were 49 persons present: 1 Hon. Member, 19 Members, 4 *Medii Socii*, and 25 Visitors.

## MEETING HELD NOVEMBER 12TH, 1869.

W. C. Merriman, Esq., presented an Ostrich Egg, Nest of the Oriole, and two pairs of Horns of the Klip-Springer, from S. Africa, and thanks ordered to be given for the same.

H. S. Sankey exhibited a Brazilian Beetle.

E. F. Vicars read a Paper, written by W. D. Fenning, on "The Study of Natural History in London."

There were 49 persons present: 1 Hon. Member, 19 Members, 4 *Medii Socii*, and 25 Visitors.

## MEETING HELD NOVEMBER 26TH, 1869.

A bank-note of ten kreutzers was presented by R. Mann, and a coin, found at Aldbourne, by Mr. Perkins.

A paper was read A. de B. Hovell, on Avebury.

There were 37 persons present: 1 Hon. Member, 21 Members, 2 *Medii Socii*, and 13 Visitors.

## MEETING HELD DECEMBER 10TH, 1869.

There were no exhibitions in order to give more time for Mr. Geo. Whittall's lecture on Phrenology, which he practically illustrated by experiments on two of those present, the truth of his deductions being acknowledged by all.

There were 101 persons present: 5 Hon. Members, 24 Members, 4 *Medii Socii*, and 68 Visitors.

## MEETING HELD DECEMBER 13TH, 1869.

This was a private meeting to discuss the work of the past half-year, and to make arrangements for papers, &c., next year. A very fair number of Members agreed to prepare papers during the holidays.

## ARCHÆOLOGY.

This section has not been at all lively this half-year; a new Cabinet, however, has been added by the Society, which contains all the curiosities, previously contained in the table cases, and all the other similar objects presented this half-year. The coin collection has not been much added to, the increase being chiefly in tokens and foreign coins. W. E Swetenham presented two ancient Greek coins, at present the only ones of the kind in the possession of the Society.

## ENTOMOLOGICAL NOTICES.

Names of those whose initials occur in the following List:—

| | |
|---|---|
| A.W.B. ... ... .. ... | A. W. Banks |
| C.B. ... ... ... ... | Mr. C. Brampton |
| C.M.B. ... ... ... ... | C. M. Bull, Esq. |
| A.C.C. ... ... ... ... | A. C. Champneys |
| J.H.R.C. ... ... ... ... | J. H. R. Clark |
| C.J.C. ... ... ... ... | C. J. Cole |
| W.F. ... ... ... ... | W. Fergus, Esq., M.D. |
| R.F. ... ... ... ... | R. Francis |
| J.B.F. ... ... ... ... | J. B. Fuller |
| E.L.H. ... ... ... ... | E. L. Hesketh |
| A.H. ... ... ... ... | A. Hoffman |
| H.M. ... ... ... ... | H. Manders |
| W.M. ... ... ... ... | W. Mansell, Esq. |
| G.C.M. ... ... ... ... | G. C. Mansel |
| G.E.M. ... ... ... ... | G. E. Mew |
| E.M. ... ... ... ... | E. Meyrick |
| C.P.N. ... ... ... ... | C. P. Nash |
| T.A.P. ... ... ... ... | Rev. T. A. Preston |
| E.S.P. ... ... ... ... | E. S. Preston. |
| A.H.B.R. ... ... ... ... | A. H. B. Reynardson |
| H.S. ... ... ... ... | H. Sieveking |
| C.A.S. ... ... ... ... | C. A. Sladen |
| J.S. ... ... ... ... | Rev. J. Sowerby |
| H.C.S. ... ... ... ... | H. C. Spry |
| J.S.T. ... ... ... ... | Rev. T. S. Thomas. |
| F.E.T. ... ... ... ... | F. E. Thompson, Esq. |
| H.J.V. ... ... ... ... | H. J. Verrall. |
| C.B.W. ... ... ... ... | C B. Woolcombe |

## RHOPALOCERA.

| | | | |
|---|---|---|---|
| Gonepteryx Rhamni ... ... | Brimstone ... ... | Aug. 11... | J.S. |
| | | Aug. 19... | F.E.T. |
| Colias Edusa ... ... ... | Clouded Yellow ... | Aug. 15... | H.M. |
| Pieris Rapæ ... ... ... | Small White... ... | Nov. 19... | (late) R.F. |
| Vanessa Atalanta ... ... | Red Admiral... ... | Oct. 31 ... | (late) J.B.F.— E.L.H. |
| V. Urticæ . . ... ... ... | Small Tortoise-shell | Nov. 19... | (late) R.F. |
| Argynnis Paphia ... ... | Silver-washed Fritillary ... ... | Aug. 22... | (late) J.S. |
| Thecla Quercus ... ... ... | Purple Hairstreak | Aug. 24... | J.B.F. |
| Chrysophanus Phlæas ... | Small Copper ... | Aug. 20... | J.S. |
| Polyommatus Argiolus ... | Holly Blue ... ... | Aug. 25... | second brood J.B.F. |
| P. Corydon ... ... ... ... | Chalk-hill Blue ... | | |
| P. Agestis ... ... ... ... | Brown Argus ... | Aug. 24... | second brood A.C.C. |

## SPHINGINA.

| | | | |
|---|---|---|---|
| Smerinthus Ocellatus... ... | Eyed Hawk ... ... | Aug. 27... | larva |
| S. Populi ... ... ... ... | Poplar Hawk... ... | Aug. 15... | larva G.E.M. |
| S. Tiliæ ... ... ... ... | Lime Hawk ... ... | Aug. 24... | larva H.S. |
| Acherontia Atropos ... ... | Death's Head Hawk | Oct. 5 ... | |
| Sphinx Convolvuli ... ... | Convolvulus Hawk | Oct. 9 ... | C.A.S. |
| S. Ligustri ... ... ... ... | Privet Hawk... ... | Aug. 15... | larva W.F. |
| Chærocampa Elpenor... ... | Large Elephant Hawk... ... ... | Aug. 12... | larva C.B. |
| Macroglossa Stellatarum... | Hummingbird Hawk | Oct. 17 ... | (seen) A.H.B.R. |
| Sesia Fuciformis... ... ... | Broad-bordered Clearwing ... ... | July 1—7 | |

## BOMBYCINA.

| | | | |
|---|---|---|---|
| Pygæra Bucephala ... ... | Buff tip ... ... ... | Aug. 23... | larva C.P.N. |
| Arctia Caja ... ... ... ... | Tiger Moth ... ... | Aug. 15... | moth C.J.C. |
| Dasychira Pudibunda ... | Pale Tussock... ... | Sept. 15... | larva A.H. |
| Orgyia antiqua ... ... ... | Vapourer ... ... | Aug. 18 ... | moth C.B.W. |
| | | Aug. 21... | larva J.S.T. |
| Pœcilocampa populi ... ... | December moth ... | Dec. 13 ... | C.M.B. |

## NOCTUINA.

| | | | |
|---|---|---|---|
| Acronycta Psi ... ... ... | Dagger ... ... ... | Aug. 18.. | larva |
| Bryophila perla ... ... ... | ... ... ... ... ... | Aug. 20... | H.J.V. |
| Heliophobus Popularis ... | ... ... ... ... ... | Aug. 26... | J.B.F. |

| | | | |
|---|---|---|---|
| Luperina Testacea ... ... ... ... ... ... ... | Aug. 18... | T.A.P. |
| Apamea Oculea ... ... ... ... ... ... ... ... | Aug. 24... | J.B.F. |
| Rusina tenebrosa ... ... ... ... ... ... ... | Aug. 26... | J.B.F. |
| Agrotis Tritici ... ... ... ... ... ... ... ... | Aug. 23... | E.M. |
| Cerastis Vaccinii ... ... ... ... ... ... ... | Oct. 13... | Mrs. Hood |
| Phlogophora Meticulosa .. | Angle shades ... | Sept. 24... | G.C.M. |
| Amphipyra Tragopogonis... | Mouse ... ... ... | Aug. 19... | E.S.P. |
| Mania Maura ... ... ... ... ... ... ... ... | Aug. 17... | H.C.S. |
| Catocala Nupta ... ... ... | Red Underwing ... | | |

GEOMETRINA.

| | | | |
|---|---|---|---|
| Rumia Crataegata ... ... | Brimstone Moth ... | Sep. 3... | A.W.B. |
| Ennomos Angularia ... ... ... ... ... ... ... | | Aug. 22... | C.P.N. |
| Asthena candidata ... ... ... ... ... ... ... | | Aug. 24... | J.B.F. |
| Oporabia dilutata ... ... ... ... ... ... ... | | Oct. 2 ... | H.J.V. |
| Melanthia Ocellata ... ... | Purple bar ... ... | Aug. 24... | J.B.F. |
| Cidaria Miata ... ... ... ... ... ... ... ... | | Oct. 1 ... | W.M. |
| C. Russata ... ... ... ... ... ... ... ... ... | | Aug. 29... | T.A.P. |
| C. Fluctuata ... ... ... ... ... ... ... ... | | Aug. 29... | T.A.P. |
| C. Ferrugata ... ... ... ... ... ... ... ... | | Aug. 24... | E.L.H. |
| Scotosia Dubitata ... ... ... ... ... ... ... | | Sept. 25... | J.H.R.C. |
| Cheimatobia Brumata ... | Winter Moth... .. | | J.S.T. |

PTEROPHORINA.

| | | | |
|---|---|---|---|
| Alucita Polydactyla ... ... | Many plume... ... | Aug. 28... | H.J.V. |

## REMARKS.

In the Rhopalocera we have only to notice the capture of *P. Corydon*, a butterfly new to our list, at Glory Ann, and that *P. Argiolus* has been observed in a new locality, the College bathing place. Before this year this butterfly (*Argiolus*) was quite unknown to our list, but it has now become singularly plentiful.

In the Sphingina *Ligustri* has been taken feeding on holly and box, by W. Fergus, Esq., and other specimens were found by Miss A. Bradley, Rev. J. S. Thomas, and others.

We have also to notice the capture of the Death's-head Hawk (*Atropos*). A pair of the Clearwing Hawk (*Fuciformis*) was taken at Savernake House during the holidays.

On August 15th a pendent wasp's nest, deserted, was found by F. W. Head near the Forest.

A Hornet was found on October 3rd, by J. H. Garland.

And the last Wasp seen on November 1st, by H. Power.

The curious corn parasite *(Vibrio tritici)* has been observed at Devizes, and at Ramsbury, by E. Meyrick, in both which places much harm was done to the crop.

We may also mention that A. W. Banks had two silkworm moths, a male and female, come out of the same cocoon which probably they had spun together.

A box of moths has been presented by Rev. J. W. Mills.

## GEOLOGY.

THE following papers have been read before the Section during the Half-year:

*Date*

Sept. 10th, by W. E. MULLINS, ESQ., on "The present mode of studying Geology."

Sept. 24th, by J. B. FULLER, on "The Geology of Weymouth and the Isle of Portland."

Oct. 22nd, by S. B. DIXON, ESQ., on "The Somersetshire Coal-Fields."

Nov. 5th, by H. J. VERRALL, on "The Geology of Sussex and the Denudation of the Weald."

Dec. 3rd, by REV. J. F. BRIGHT, on "Some Mammalian remains from Thame."

## ORNITHOLOGICAL NOTICES.

| | | | |
|---|---|---|---|
| Falco subbuteo ... | Hobby hawk ... ... ... ... | | (shot). |
| Lanius excubitor... | Great Grey Shrike... ... ... | | (shot) Nov. 20. |
| Turdus pilaris ... | Field-fare ... | J. B. Oakeley | seen (early) Nov. 7. |
| Turdus iliacus ... | Redwing ... | J. B. Oakeley | seen (early) Nov. 26. |
| Hirundo rustica .. | Swallow ... ... | F. Strickland | seen (late) Nov. 11. |
| Hirundo urbica ... | House Martin... | J. B. Fuller<br>H. J. Verrall | seen (late) Nov. 1. |
| Phœnicura ruticilla | Redstart... ... | J. B. Oakeley | seen (late) Oct. 31. |
| Motacilla boarula... | Grey Wagtail... ... ... ... | | shot, Nov. and Dec. |
| Scolopax gallinago | Common Snipe | J. B. Oakeley | seen (early) Sept. 11. |
| Phalaropus lobatus | Grey Phalarope | S. Featherstone | Sept. 14. |
| Fratercula arctica | Puffin ... ... ... ... ... ... | | Oct. 25. |

There has not been much out-door work done this half-year, so the list of notices is rather small; but in it there are some worth mentioning as *Phalaropus lobatus*, which was shot by Featherstone, and *Lanius excubitor*,

obtained at Poulton, and *Fratercula arctica* (Puffin), two specimens of which were obtained, one caught by hand and the other found dead, nearly all of which are new species to our list.

The following birds have been added to the collection.—

10 Indian birds, by F. W. Bourdillon.

4 Humming birds and 5 New Zealand birds, by C. R. Waldron.

2 Kentish Plovers (*Charadrius cantianus*), by E. im Thurn, Esq.

2 Sanderlings (*Charadrius calidris*), by E. im Thurn, Esq.

Red-backed Shrike (*Lanius collurio*) by Rev. T. A. Preston.

Grey Phalarope (*Phalaropus lobatus*), by S. Featherstone.

Redbreast (*Erythaca rubecula*), by J. B. Fuller.

## BOTANICAL NOTICES.

There never has been a more favourable season for Botanical purposes than that which has just passed. The number of new species and new localities is enormous, and it is to be regretted, therefore, that members of the School were not more active. From the subjoined lists it will be seen that most of the work was done by only two or three. So much of our district has yet to be worked that it is clear we have not by any means exhausted our Flora. Most of the additions to our list require to be well looked for. The areas upon which they grow are exceedingly small, and can therefore be very easily overlooked, and it is to be hoped that next year will see more workers, and, if possible, more results.

Names of those who have contributed towards the perfection of the list:—

D. Coles, Rev. G. W. De Lisle, J. B. Fuller, J. H. Garland, C. R. Gunner, E. L. Hesketh, G. C. Mansel, E. S. Preston, Rev. J. Sowerby (J. S. in list), F. E. Thompson, Esq. (F. E. T. in list), H. J. Verrall, and J. S. Wood.

The Calendar has been worked out after a plan suggested by the Rugby School Natural History Society; the double letters indicate that the plant was plentiful—thus aa, indicates that it was plentiful in August, ss, in September, &c.—A letter in brackets indicates that the plant was really past flowering, but that a few flowers were still out.

| | | | | | |
|---|---|---|---|---|---|
| **Clematis** | | | | | |
| vitalba ..... | a | s | — | — | — |
| **Ranunculus** | | | | | |
| heterophyllus | a | — | — | — | — |
| peltatus..... | a | — | — | — | — |
| flammula ..... | — | s | o | — | — |
| acris ..... | aa | ss | oo | nn | d |
| repens ..... | aa | ss | oo | n | — |
| arvensis ..... | — | — | — | n | d |
| *lingua ..... | a | s | — | — | — |
| **Caltha** | | | | | |
| palustris ..... | — | s | o | — | — |
| **Papaver** | | | | | |
| rhœas ..... | aa | ss | oo | — | — |
| dubium ..... | a | s | o | — | — |
| Lecoqii ..... | a | s | — | — | — |
| **Chelidonium** | | | | | |
| majus..... | a | — | — | — | — |
| **Fumaria** | | | | | |
| officinalis ..... | aa | s | oo | n | d |
| **Nasturtium** | | | | | |
| officinale ..... | aa | s | o | n | — |
| palustre ..... | — | — | o | — | — |
| **Sisymbrium** | | | | | |
| officinale ..... | a | s | o | — | — |
| thalianum..... | — | — | — | n | — |
| **Alliaria** | | | | | |
| officinalis ..... | a | — | — | — | — |
| **Erysimum** | | | | | |
| cheiranthoides | a | — | — | — | — |
| **Brassica** | | | | | |
| oleracea..... | — | — | o | n | — |
| campestris ... | — | s | o | n | — |
| **Sinapis** | | | | | |
| arvensis ..... | aa | ss | oo | nn | d |
| alba ..... | aa | s | o | n | — |
| **Lepidium** | | | | | |
| campestre ..... | a | s | o | n | — |
| **Capsella** | | | | | |
| bursa-pastoris | aa | ss | oo | nn | d |
| **Isatis** | | | | | |
| *tinctoria ..... | a | s | o | n | — |
| **Raphanus** | | | | | |
| Raphanistrum | a | s | o | n | — |
| **Reseda** | | | | | |
| lutea ..... | a | s | — | — | — |
| luteola ..... | — | — | o | — | — |
| **Helianthemum** | | | | | |
| vulgare ..... | a | s | o | n | — |
| **Viola** | | | | | |
| odorata (alba) | — | s | — | n | — |
| Reichenbachiana | — | — | o | n | — |
| Riviniana ..... | a | — | o | n | — |
| tricolor ..... | — | — | — | n | — |
| (var) arvensis | aa | ss | oo | nn | d |
| **Polygala** | | | | | |
| vulgaris ..... | a | s | — | — | — |
| **Cucubalus** | | | | | |
| *bacciferus ... | a | — | — | — | — |
| **Silene** | | | | | |
| inflata ..... | a | — | — | — | — |
| **Lychnis** | | | | | |
| flos-cuculi ..... | — | s | o | — | — |
| vespertina..... | aa | ss | o | — | — |
| diurna ..... | a | s | oo | n | — |
| Githago ..... | — | s | — | — | — |
| **Sagina** | | | | | |
| procumbens ... | — | s | — | — | — |
| **Arenaria** | | | | | |
| serpyllifolia ... | — | — | o | n | — |
| leptoclados ... | a | — | o | — | — |
| **Stellaria** | | | | | |
| media ..... | aa | ss | oo | nn | d |
| graminea ..... | a | — | — | — | — |
| **Malachium** | | | | | |
| aquaticum..... | a | — | — | — | — |
| **Cerastium** | | | | | |
| glomeratum ... | — | — | — | n | — |
| triviale ..... | aa | ss | oo | nn | d |
| **Malva** | | | | | |
| moschata ..... | a | s | o | — | — |
| sylvestris ... .. | aa | ss | oo | n | — |

| | | | | | |
|---|---|---|---|---|---|
| rotundifolia ... | aa | s | o | n | d |
| **Hypericum** | | | | | |
| *calycinum ... | a | — | — | — | — |
| *Androsæmum | a | — | — | — | — |
| quadrangulum | a | s | — | — | — |
| perforatum ... | a | s | o | n | — |
| humifusum ... | a | — | — | — | — |
| hirsutum ..... | a | s | — | — | — |
| pulchrum ..... | a | — | o | — | — |
| **Geranium** | | | | | |
| *sylvaticum ... | a | — | o | — | — |
| pratense ..... | aa | s | o | n | — |
| dissectum ..... | a | s | — | n | — |
| columbinum ... | a | — | o | — | — |
| rotundifolium | a | — | o | n | — |
| molle ..... | a | s | o | n | — |
| lucidum ..... | a | — | — | — | — |
| Robertianum | aa | ss | o | n | — |
| **Linum** | | | | | |
| Catharticum ... | aa | s | o | — | — |
| **Oxalis** | | | | | |
| corniculata ... | — | — | o | — | — |
| **Ulex** | | | | | |
| europæus ..... | — | — | oo | n | d |
| nanus ... ..... | — | s | o | — | — |
| **Ononis** | | | | | |
| arvensis ..... | aa | — | — | — | — |
| **Medicago** | | | | | |
| lupulina..... | aa | ss | o | — | — |
| **Trofolium** | | | | | |
| pratense ..... | aa | ss | oo | n | — |
| arvense ..... | — | s | — | — | — |
| repens ..... | aa | ss | oo | n | — |
| procumbens ... | aa | s | o | — | — |
| minus..... | a | s | o | — | — |
| **Lotus** | | | | | |
| corniculatus ... | aa | s | o | — | — |
| major ..... | a | s | o | — | — |
| **Anthyllis** | | | | | |
| vulneraria..... | a | s | — | — | — |

| | | | | | |
|---|---|---|---|---|---|
| **Vicia** | | | | | |
| Cracca ..... | a | s | — | — | — |
| hirsuta ..... | — | s | — | — | — |
| gracilis ..... | — | s | — | — | — |
| sylvatica ..... | a | — | — | — | — |
| sepium ..... | a | s | o | n | — |
| sativa..... | a | s | — | — | — |
| **Lathyrus** | | | | | |
| pratensis ..... | aa | s | — | — | — |
| **Onobrychis** | | | | | |
| sativa ..... | aa | — | o | — | — |
| **Spiræa** | | | | | |
| ulmaria ..... | aa | ss | oo | n | — |
| **Agrimonia** | | | | | |
| eupatoria ..... | aa | s | o | — | — |
| odorata ..... | a | — | — | — | — |
| **Alchemilla** | | | | | |
| arvensis ..... | — | — | — | n | d |
| **Sibbaldia** | | | | | |
| *procumbens | a | — | o | — | — |
| **Potentilla** | | | | | |
| anserina ..... | a | s | — | — | — |
| reptans ..... | a | s | — | — | — |
| Tormentilla ... | a | s | o | n | — |
| **Fragaria** | | | | | |
| vesca ..... | a | s | — | n | — |
| **Rubus** | | | | | |
| discolor ..... | a | ss | — | — | — |
| cæsius ..... | aa | s | o | — | — |
| **Geum** | | | | | |
| urbanun..... | aa | s | oo | n | — |
| rivale..... | — | — | — | n | — |
| **Rosa** | | | | | |
| arvensis..... | — | — | — | n | — |
| **Lythrum** | | | | | |
| salicaria..... | a | — | — | — | — |
| **Eplobium** | | | | | |
| hirsutum ..... | aa | s | — | — | — |
| parviflorum ... | aa | s | o | — | — |
| montanum ... | a | s | — | — | — |
| palustre..... | a | s | o | — | — |

| | | | | | |
|---|---|---|---|---|---|
| Circæa | | | | | |
| lutetiana ..... | a | — | — | — | — |
| Bryonia | | | | | |
| dioica ..... | a | — | — | — | — |
| Spergula | | | | | |
| arvensis..... | a | s | o | — | — |
| Scleranthus | | | | | |
| annuus ..... | a | s | o | n | — |
| Sedum | | | | | |
| Fabaria..... | a | — | — | — | — |
| reflexum ..... | a | — | — | — | — |
| Apium | | | | | |
| graveolens..... | a | — | — | — | — |
| Helosciadium | | | | | |
| nodiflorum ... | a | s | o | n | — |
| Sison | | | | | |
| amomum ..... | — | — | (o) | (n) | — |
| Pimpinella | | | | | |
| saxifraga ..... | aa | ss | oo | n | d |
| Sium | | | | | |
| angustifolium | a | s | o | — | — |
| Æthusa | | | | | |
| cynapium ..... | aa | ss | oo | n | — |
| Silaus | | | | | |
| pratensis ..... | a | — | — | n | — |
| Angelica | | | | | |
| sylvestris ..... | aa | ss | o | n | d |
| Pastinaca | | | | | |
| sativa... ..... .. | aa | s | o | n | d |
| Heracleum | | | | | |
| sphondylium .. | aa | ss | o | n | — |
| Daucus | | | | | |
| carota ..... | aa | ss | o | n | d |
| Torilis | | | | | |
| Anthriscus ... | aa | s | o | n | — |
| infesta ..... | a | — | — | — | — |
| Scandix | | | | | |
| pecten ..... | aa | s | o | n | d |
| Anthriscus | | | | | |
| sylvestris ..... | a | s | o | n | — |
| Chærophyllum | | | | | |
| temulum ..... | aa | — | o | n | — |
| Conium | | | | | |
| maculatum .. | a | — | — | — | — |
| Hedera | | | | | |
| Helix ..... | — | — | o | n | — |
| Sambucus | | | | | |
| nigra ..... | a | s | — | — | — |
| Lonicera | | | | | |
| Periclymenum | a | s | o | — | — |
| Symphoricarpos | | | | | |
| *racemosus ... | a | — | — | — | — |
| Sherardia | | | | | |
| arvensis..... | a | s | — | n | — |
| Asperula | | | | | |
| cynanchica ... | a | — | — | — | — |
| Galium | | | | | |
| cruciatum..... | — | — | o | — | — |
| Aparine..... | aa | s | o | n | d |
| Mollugo..... | aa | ss | o | — | — |
| verum ..... | aa | ss | o | n | — |
| palustre..... | a | s | o | — | — |
| Valeriana | | | | | |
| officinalis ..... | a | s | — | — | — |
| Valerianella | | | | | |
| olitoria ..... | a | — | — | n | — |
| dentata..... | a | — | — | — | — |
| Dipsacus | | | | | |
| sylvestris ... .. | a | s | o | — | — |
| Knautia | | | | | |
| arvensis..... | aa | ss | oo | n | — |
| Scabiosa | | | | | |
| succisa ..... | aa | ss | o | n | — |
| columbaria ... | a | ss | oo | n | — |
| Eupatorium | | | | | |
| cannabinum ... | aa | ss | — | — | — |
| Erigeron | | | | | |
| acris ..... | a | — | — | — | — |
| Bellis | | | | | |
| perennis ..... | aa | ss | oo | n | d |

| | | | | | |
|---|---|---|---|---|---|
| **Inula** | | | | | |
| *Helenium ... | a | — | — | — | — |
| Conyza ..... .. | a | — | — | — | — |
| **Pulicaria** | | | | | |
| dysenterica... | — | s | o | — | — |
| **Bidens** | | | | | |
| cernua ..... | — | s | o | — | — |
| tripartita ..... | — | s | o | n | — |
| **Achillea** | | | | | |
| Millefolium ... | aa | ss | oo | nn | d |
| ptarmica ..... | a | s | o | — | — |
| **Anthemis** | | | | | |
| arvensis..... | a | s | — | n | — |
| cotula ..... | a | — | — | — | — |
| **Matricaria** | | | | | |
| Parthenium ... | a | s | o | — | — |
| inodora ..... | a | ss | o | n | d |
| **Chrysanthemum** | | | | | |
| Leucanthemum | a | s | o | — | — |
| segetum ..... | — | s | o | — | — |
| **Artemisia** | | | | | |
| *Absinthium... | a | — | — | — | — |
| vulgaris..... | a | ss | o | — | — |
| **Tanacetum** | | | | | |
| vulgare ..... | — | s | o | n | — |
| **Filago** | | | | | |
| germanica..... | — | s | o | (n) | — |
| **Gnaphalium** | | | | | |
| uliginosum ... | a | s | o | — | — |
| sylvaticum ... | a | s | o | (n) | — |
| **Senecio** | | | | | |
| vulgaris..... | aa | ss | oo | nn | d |
| Jacobaea ..... | aa | ss | oo | n | d |
| aquaticus ..... | aa | s | o | n | d |
| **Carlina** | | | | | |
| vulgaris..... | a | — | o | — | — |
| **Arctium** | | | | | |
| majus ..... | a | s | o | — | — |
| nemorosum ... | a | — | s | — | — |
| intermedium... | a | — | — | — | — |

| | | | | | |
|---|---|---|---|---|---|
| **Serratula** | | | | | |
| tinctoria ..... | a | s | o | — | — |
| **Centaurea** | | | | | |
| nigra ..... | aa | ss | oo | — | — |
| cyanus ..... | — | — | o | n | — |
| scabiosa..... | aa | s | o | — | — |
| **Carduus** | | | | | |
| nutans ..... | a | s | o | n | — |
| crispus ..... .. | aa | ss | o | n | — |
| lanceolatus ... | aa | ss | o | n | — |
| arvensis..... | aa | ss | o | — | — |
| palustris..... | a | s | o | — | — |
| acaulis ..... | aa | ss | o | — | — |
| **Lapsana** | | | | | |
| communis ..... | aa | ss | oo | n | — |
| **Hypochoeris** | | | | | |
| radicata... ..... | aa | s | — | — | — |
| **Apargia** | | | | | |
| hispida ..... | aa | s | o | — | — |
| autumnalis ... | aa | ss | oo | n | d |
| **Tragopogon** | | | | | |
| minor ..... | — | s | o | — | — |
| **Picris** | | | | | |
| hieracioides ... | a | s | o | n | — |
| **Leontodon** | | | | | |
| taraxacum..... | aa | ss | oo | n | d |
| **Sonchus** | | | | | |
| oleraceus ..... | a | s | o | — | — |
| asper ..... | a | s | o | n | d |
| arvensis..... | a | s | o | — | — |
| **Crepis** | | | | | |
| virens..... | aa | ss | oo | n | d |
| **Hieracium** | | | | | |
| pilosella ..... | aa | s | o | — | — |
| vulgatum ... | a | s | o | — | — |
| **Campanula** | | | | | |
| glomerata ..... | aa | s | o | n | — |
| Trachelium ... | a | s | o | — | — |
| rotundifolia ... | aa | s | oo | n | — |
| **Calluna** | | | | | |
| vulgaris ... | aa | s | o | — | — |

| | | | | | |
|---|---|---|---|---|---|
| **Erythræa** | | | | | |
| centaurium ... | a | s | — | — | — |
| **Gentiana** | | | | | |
| amarella ..... | a | s | o | — | — |
| **Convolvulus** | | | | | |
| arvensis..... | aa | s | o | — | — |
| sepium ..... | aa | s | o | — | — |
| **Cuscuta** | | | | | |
| trifolii ..... | a | s | o | — | — |
| **Cynoglossum** | | | | | |
| officinale ..... | a | s | o | — | — |
| **Borago** | | | | | |
| * officinalis ... | a | s | — | — | — |
| **Lycopsis** | | | | | |
| arvensis ..... | — | — | o | n | — |
| **Symphytum** | | | | | |
| officinale ..... | aa | s | o | n | — |
| **Echium** | | | | | |
| vulgare ..... | — | s | — | — | — |
| **Lithospermum** | | | | | |
| arvense ..... | a | s | — | — | — |
| **Myosotis** | | | | | |
| palustris ..... | aa | ss | oo | n | — |
| arvensis..... | aa | ss | oo | n | — |
| **Solanum** | | | | | |
| Dulcamara | aa | s | — | — | — |
| **Atropa** | | | | | |
| * Belladonna | a | — | — | — | — |
| **Lycium** | | | | | |
| * barbarum ... | a | — | — | — | — |
| **Verbascum** | | | | | |
| Thapsus ..... | a | s | — | — | (d) |
| nigrum ..... | a | s | — | — | — |
| **Linaria** | | | | | |
| cymbalaria .. | — | — | o | n | — |
| vulgaris..... | aa | s | o | n | — |
| spuria ..... | a | s | — | — | — |
| **Scrophularia** | | | | | |
| nodosa ..... | a | s | — | — | — |
| aquatica ..... | a | s | o | — | — |

| | | | | | |
|---|---|---|---|---|---|
| **Melampyrum** | | | | | |
| pratense ..... | a | s | — | — | — |
| **Pedicularis** | | | | | |
| palustris ..... | a | — | — | — | — |
| **Rhinanthus** | | | | | |
| Crista-galli ... | a | — | — | — | — |
| **Euphrasia** | | | | | |
| officinalis ..... | aa | ss | o | — | — |
| odontites ..... | a | s | o | — | — |
| **Veronica** | | | | | |
| Anagallis ..... | aa | s | o | n | — |
| Beccabunga ... | aa | s | — | — | — |
| Chamædrys ... | a | — | — | n | — |
| officinalis ..... | — | s | — | — | — |
| serpyllifolia ... | — | s | o | n | — |
| arvensis..... | a | — | o | n | — |
| agrestis ..... | a | — | o | n | — |
| polita ..... | a | — | o | n | d |
| Buxbaumii ... | a | s | oo | n | d |
| hederifolia..... | — | — | o | n | — |
| **Mentha** | | | | | |
| aquatica ..... | aa | s | o | — | — |
| arvensis ..... | aa | s | — | — | — |
| pulegium ..... | — | — | o | — | — |
| **Lycopus** | | | | | |
| europæus ..... | — | s | o | — | — |
| **Salvia** | | | | | |
| verbenaca ..... | a | — | — | — | — |
| **Origanum** | | | | | |
| vulgare ..... | a | s | o | — | — |
| **Thymus** | | | | | |
| serpyllum ..... | aa | s | o | — | — |
| **Calamintha** | | | | | |
| officinalis ..... | a | — | o | — | — |
| acinos ..... | a | s | — | — | — |
| clinopodium ... | aa | s | o | n | — |
| **Scutellaria** | | | | | |
| galericulata ... | a | s | — | — | — |
| **Prunella** | | | | | |
| vulgaris..... | aa | ss | o | n | — |

| | | | | | |
|---|---|---|---|---|---|
| **Lamium** | | | | | |
| amplexicaule | a | — | o | n | — |
| purpureum ... | aa | s | oo | n | d |
| album ..... | aa | ss | oo | n | d |
| *maculatum ... | a | — | — | n | — |
| Galeobdolon ... | — | s | — | — | — |
| **Galeopsis** | | | | | |
| Ladanum ..... | a | s | o | — | — |
| Tetrahit..... | aa | s | o | n | — |
| **Stachys** | | | | | |
| Betonica ..... | aa | s | o | — | — |
| sylvatica ..... | aa | ss | o | n | — |
| palustris ..... | aa | s | o | — | — |
| **Ballota** | | | | | |
| fœtida . ..... | a | s | o | (n) | — |
| **Ajuga** | | | | | |
| reptans ..... | — | — | o | — | — |
| **Verbena** | | | | | |
| officinalis ..... | a | s | — | — | — |
| **Primula** | | | | | |
| vulgaris ..... | — | — | — | — | d |
| veris ..... | — | s | — | — | — |
| **Anagallis** | | | | | |
| arvensis ..... | aa | ss | o | n | — |
| **Plantago** | | | | | |
| lanceolata..... | aa | ss | o | n | — |
| media..... | aa | s | o | — | — |
| major..... | aa | s | o | — | — |
| **Chenopodium** | | | | | |
| album ... ..... | aa | s | o | n | — |
| Bonus-Henricus | a | s | — | n | — |
| rubrum ..... | — | s | o | — | — |
| **Atriplex** | | | | | |
| angustifolia ... | a | s | — | — | — |
| deltoidea ..... | a | — | — | — | — |
| **Rumex** | | | | | |
| conglomeratus | aa | s | o | — | — |
| obtusifolius ... | aa | s | o | — | — |
| crispus ..... | a | s | o | n | — |
| Hydrolapathum | a | — | — | — | — |
| sanguineus ... | aa | s | o | — | — |

| | | | | | |
|---|---|---|---|---|---|
| **Polygonum** | | | | | |
| amphibium ... | a | — | — | — | — |
| lapathifolium | — | s | — | — | — |
| Persicaria ..... | aa | s | o | n | — |
| aviculare ..... | aa | ss | o | n | d |
| hydropiper ... | a | s | o | n | — |
| convolvulus ... | aa | s | o | n | — |
| **Euphorbia** | | | | | |
| Helioscopia | a | — | o | — | — |
| amygdaloides | — | s | — | — | — |
| Peplus ..... | a | s | o | n | — |
| exigua ..... | a | — | o | — | — |
| **Urtica** | | | | | |
| urens ..... | a | s | o | n | d |
| dioica ..... | aa | s | — | — | — |
| **Humulus** | | | | | |
| lupulus ..... | a | s | — | — | — |
| **Spiranthes** | | | | | |
| autumnalis ... | — | s | o | — | — |
| **Colchicum** | | | | | |
| autumnale ... | a | s | o | — | — |
| **Juncus** | | | | | |
| effusus ..... | a | s | o | — | — |
| glaucus ..... | a | s | o | — | — |
| acutiflorus ... | a | s | — | — | — |
| lamprocarpus | a | s | — | — | — |
| **Alismo** | | | | | |
| plantago ..... | a | s | — | — | — |
| **Butomus** | | | | | |
| umbellatus ... | a | s | — | — | — |
| **Triglochin** | | | | | |
| palustre ..... | — | s | — | — | — |
| **Sparganium** | | | | | |
| ramosum ..... | a | — | — | — | — |
| simplex ..... | — | s | — | — | — |
| **Potamogeton** | | | | | |
| natans ... ..... | (a) | — | — | — | — |
| **Eleocharis** | | | | | |
| palustris ..... | a | — | — | — | — |
| **Phalaris** | | | | | |
| arundinacea ... | a | — | — | — | — |

| | | | | | |
|---|---|---|---|---|---|
| Anthoxanthum | | | | | |
| odoratum ..... | a | s | — | — | — |
| Phleum | | | | | |
| pratense ..... | a | s | — | — | — |
| Alopecurus | | | | | |
| geniculatus ... | a | — | — | — | — |
| agrestis ..... | a | — | — | — | — |
| Phragmites | | | | | |
| communis ..... | a | s | — | — | — |
| Agrostis | | | | | |
| vulgaris ..... | — | s | — | — | — |
| alba ..... | a | — | — | — | — |
| Holcus | | | | | |
| lanatus ..... | aa | ss | o | n | — |
| Aira | | | | | |
| cæspitosa ..... | a | — | — | — | — |
| Arrhenatherum | | | | | |
| avenaceum ... | a | s | o | n | — |
| Poa | | | | | |
| annua ..... | aa | s | oo | n | d |
| pratensis ..... | a | — | — | — | — |
| Glyceria | | | | | |
| fluitans ..... | a | s | o | — | — |
| plicata ..... | a | — | — | — | — |
| aquatica ..... | a | s | o | — | — |

| | | | | | |
|---|---|---|---|---|---|
| Dactylis | | | | | |
| glomerata ..... | a | s | o | n | — |
| Festuca | | | | | |
| sciuroides ..... | a | — | — | — | — |
| gigantea ..... | a | s | o | — | — |
| pratensis ..... | a | s | — | — | — |
| arundinacea ... | — | s | — | — | — |
| Bromus | | | | | |
| erectus ..... | a | s | o | — | — |
| asper ..... | a | — | — | — | — |
| sterilis ..... | a | — | — | — | — |
| Serrafalcus | | | | | |
| mollis ..... | a | s | — | — | — |
| Brachypodium | | | | | |
| sylvaticum ... | a | — | — | — | — |
| Triticum | | | | | |
| caninum ..... | a | — | — | — | — |
| repens ..... | a | — | — | — | — |
| Hordeum | | | | | |
| murinum ..... | — | s | — | — | — |
| Lolium | | | | | |
| perenne ..... | aa | s | o | n | — |
| Rye ..... | — | s | — | — | — |
| Oat ..... | — | — | — | n | — |
| Barley ..... | — | — | — | n | — |

## NEW SPECIES.

| | |
|---|---|
| [Erysimum cheiranthoides ... | A specimen found in Mr. Brind's garden, accidentally introduced.] |
| Malachium aquaticum ... ... | Lockeridge, J.S. |
| Malva moschata ... ... ... | |
| var. Ramondiana *Gren and Godr* | Near Marlborough F.E.T. |
| [Oxalis corniculata ... ... | A weed in Mr. Brind's garden, said to have been probably introduced with soil from Bedwyn.] |
| Vicia gracilis ... ... ... | Railway Bank, Marlborough, J. B. Fuller and E. L. Hesketh. |
| Lythrum salicaria ... ... | Ramsbury, J.B. Fuller. |
| Epilobium palustre ... ... | Axford, J.S.; Martinsell, J.S. |

| | |
|---|---|
| Circæa lutetiana ... ... ... | The only spot, at present recorded, where this undoubtedly grows wild is the copse above the S. side of Axford, J.S. |
| Sedum fabaria ... ... ... | West Woods, J.S. |
| Apium graveolens ... ... | Water-meadows, near Elcott Mill. |
| Sison amomum ... ... ... | Lane at back of the "Ailesbury Arms" on the Bath Road, J.S. |
| Inula conyza ... ... ... | Axford. |
| Bidens tripartita ... ... | Pond near New Mill, J.S. |
| Achillea ptarmica ... ... | Mildenhall, J.S. ; Martinsell, F.E.T. |
| Arctium nemorosum ... ... | Poulton ; Overton, J.S. ; Wan's Dyke, J.S. & F.E.T.; Axford. |
| Arctium intermedium ... | Overton, J.S.; West Woods. |
| Picris hieracioides ... ... | Ogbourne Long Copse, J.S.,; S. slope of Martinsell, J.S. ; Manton Copse, J.S. ; Bedwyn, J.S. |
| Cuscuta trifolii ... ... ... | White Horse Down, J.S. ; Chisbury, J. B. Fuller and H. J. Verrall. |
| Linaria spuria ... ... ... | Bedwyn, J.S., & F.E.T., Figheldean. |
| Mentha pulegium ... ... | Martinsell, J.S. |
| Salvia verbenaca ... ... ... | Axford, J.S., "On the way to Ramsbury" was the only locality known. Re-discovered by Rev. J. Sowerby. |
| Chenopodium album ... ... | var. *viride*, Martinsell, J.S. |
| Chenopodium rubrum ... ... | Farm S.E. of Martinsell, J.S. ; between Bedwyn and Pewsey, J.S. |
| Antriplex augustifolia ... ... | Marlborough ; Axford ; Overton, J.S. |
| Antriplex deltoidea ... ... | Overton, J.S. |
| Polygonum Hydropiper ... | Mildenhall, F.E.T., New Mill, J.S. ; Ramsbury. |
| Salix viminalis ... ... ... | Omitted in all previous lists. Common. |
| Salix rubra ... ... ... ... | Manton. |
| Salix fusca ... ... ... ... | Near Martinsell. |
| Festuca pratensis ... ... | College grounds. Mildenhall. |
| Festuca pratensis var. *loliacea* | Granham Hill ; Mildenhall. |
| Hordeum murinum ... ... | Figheldean. |

NEW LOCALITIES, &c.

| | |
|---|---|
| Ranunculus Flammula ... ... | Huish Marsh, J.S. |
| Ranunculus acris ... ... ... | The sub-species occurring about Marlborough is the Ranunculus vulgatus *Jord.* |

| | |
|---|---|
| Papaver lecoqii ... ... ... | Yatesbury; Mildenhall. |
| Nasturtium palustre ... ... | Pond on the S. of Martinsell, J.S. |
| Lepidium campestre ... ... | West Woods. |
| Reseda lutea ... ... ... | Overton, J.S.; Axford, J.S. |
| Reseda luteola ... ... ... | Bedwyn, J.S. |
| Arenaria leptoclados ... ... | Overton, J.S.; Figheldean. |
| Lychnis Flos-cuculi .. ... | Axford, J.S. |
| Malva rotundifolia ... ... | Overton, J.S.; near the College; Pewsey, J.S. New Mill, Rev. G. W. De Lisle. |
| Hypericum tetrapterum ... | Lockeridge, J.S.; Axford, J.S. |
| Hypericum humifusum ... | Overton, J.S. |
| Geranium columbinum ... | Bath Road, J.S. |
| Ulex nanus ... ... ... .. | Chisbury, J.S. & G.W.D.L.; Shaw's Farm, J.S. |
| Trifolium arvense ... ... ... | Near New Mill, J.S. |
| Lotus major ... ... ... ... | Newton, J.S.; West Woods, J.S.; Huish Marsh, J.S. |
| Vicia hirsuta ... ... ... ... | New Mill, Rev. G. W. De Lisle. |
| Agrimonia odorata ... ... | West Woods, J.S. |
| Epilobium montanum ... ... | New Mill, Rev. G. W. De Lisle. |
| Circæa lutetiana ... ... ... | Gardens, Marlborough. |
| Scleranthus annuus ... ... | Huish, J.S.; Long's Penning, J.S. |
| Silaus pratensis ... ... ... | Mildenhall, J.S.; Axford. |
| Torilis infesta ... ... ... | Axford; Overton, J.S. |
| Spergula arvensis ... ... ... | Folly Farm; Pewsey Valley (*passim*). |
| Valerianella olitoria ... ... | Fields at bottom of White Horse Down. |
| Valerianella dentata ... ... | Overton, J.S. |
| Tragopogon minor... ... ... | Axford, J.S.; Ramsbury, J.S. |
| Eupatorium cannabinum ... | New Mill, J.S. |
| Erigeron acris ... ... ... | Railway cutting, Savernake, J.S. & F.E.T. |
| Bidens cernua ... ... ... | Newton, J.S.; New Mill, J.S. |
| Matricaria Parthenium... ... | Martinsell, J.S. |
| Artemisia vulgaris ... ... | Poulton; Axford, J.S.; Kennett; Down above Preshute, J.S.; New Mill, Rev. G. W. De Lisle. |
| Tanacetum vulgare ... ... | Martinsell, F.E.T. |
| Gnaphalium sylvaticum ... | Ivy's Farm, J.S.; New Mill, J.S.; Martinsell, J.S. |
| Serratula tinctoria ... ... | Long's Penning, J.S. |
| Centaurea cyanus ... ... ... | Canal bank, S. of Martinsell, J.S. |
| Phyteuma orbiculare ... ... | Down near Yatesbury, Rev. A. C. Smith. |
| Campanula trachelium... ... | Spy Park, West Woods, J.S.; Bedwyn, J.S.; Huish, J.S. |

| | |
|---|---|
| Lycopsis arvensis ... ... ... | Canal bank, Savernake, J.S. |
| Echium vulgare ... ... ... | Wan's Dyke, F.E.T. |
| Verbascum nigrum ... ... | Overton, J.S.; Clatford. |
| Origanun vulgare ... ... ... | New Mill, J.S. |
| Scutellaria galericulata ... | Axford; Mildenhall, F.E.T. |
| Verbena officinalis ... ... | Mildenhall, near the river; Sun Lane, Marlborough, J.S.; Bedwyn, J.S. |
| Polygonum amphibium ... | Ramsbury. |
| Butomus umbellatus ... ... | Ramsbury. |
| Juncus acutiflorus... ... ... | Mildenhall. |
| Juncus lamprocarpus ... ... | Axford. |
| Sparganium simplex ... ... | Ramsbury. |
| Triticum canium ... ... ... | Axford. |
| Triglochin pulustre ... ... | Huish Marsh, J.S. |

White varieties of the following have been found :

| | |
|---|---|
| Geranium pratense ... ... | Overton, J.S. |
| Epilobium montanum ... | Wan's Dyke in West Woods, F.E.T. |
| Centaurea nigra ... ... ... | Lockeridge, J.S. |
| Centaurea Scabiosa ... ... | Axford. |
| Calluna vulgaris ... ... ... | Shaw's Farm, J. H. Garland. |

## DONATIONS TO THE MUSEUM.

*Archæology.*—

Coins by A. W. Banks, R. M. B. Glasse, W. A. Eckersley, Rev. G. W. De Lisle, E. W. Swetenham, G. H. Dawson, Esq., A. P. C. Boevey, C. A. Sladen, J. H. R. Clarke, Mr. Perkins, and Rev. J. W. Mills.

Stone from Pompeii, by E. W. Swetenham.

Curiosities from Italy, by H. W. Simpkinson.

Title-page of a Book belonging to Frances Seymour, by Rev. G. G. Bradley.

Austrian Bank-note, by W. A. Eckersley.

*Entomology.*—

Pair of *Collix Sparsata*, by Mr. T. Brown, Cambridge.

Lulworth Skipper (*P. Actæon*), by J. H. Garland.

Pendent Wasp's Nest from the Forest, by F. Head.

Silver-washed Fritillary (*A. Paphia*), and other Butterflies, by G. E. Manisty.

Death's Head Hawk-moth (*A. Atropos*), by the President.

3 *A. rubricata*, 1 *E. Ochroleuca*, 1 *S. Sticticalis*, 3 *L. dispar*, *A. citraria*, Rev. J. W. Mills.

*Geology and Mineralogy.*—

Collections of Fossils, by W. D. Smith, Esq., and L. W. Hinxman.

Collections of Minerals, by C. R. Waldron, E. W. Swetenham, F. H. Thirlwall, Mr. Hawkins.

Asparagus Stone in Foliated Talc, by E. F. im Thurn, Esq.

Amethyst, by C. G. H. Mann.

Ammonite, by H. T. King.

Iron Pyrites, by E. H. Peacock.

Mammalian Remains, by Rev. J. F. Bright.

*Ornithology.*—

Humming Birds and New Zealand Birds, by C. R. Waldron.

Indian Birds, by T. F. Bourdillon.

Grey Phalarope, *(P. lobatus)*, by S. W. Featherstone.

Pair of Kentish Plovers *(C. Cantianus)*, and pair of Sanderlings, *(C. arenaria)*, by E. F. im Thurn, Esq.

Ostrich's Egg and Oriole's nest, by W. C. Merriman, Esq.

*Various.*—

Leveret's skull, by H. A. M. Power.

Norwegian bread, 50 years old, by E. W. Swetenham.

Fresh-water Shells from the Nile, Wild Date, and Piece of the Queen's Tomb at Thebes. } by Mr. Baker, Cambridge.

Four Esquimaux Arrows, Indian Brush, Cloak of South Sea Island Chief, 4 play-bills printed on board the "Enterprise," and Saw of Saw-fish. } by Mr. Phelps.

Human hand (mummified) from Arica, in Peru, by W. Fergus, Esq., M.D.

Sun-fish, by Sergeant Adams.

Painting on Talc, by A. C. Hilton.

Revinque (or Spanish Whip) and Bolas, from South America, by W. J. Smythies, Esq.

Iron pipe filled with Carbonate of Lime, by the Bursar.

Two Pairs of Horns of the Klipspringer, by W. C. Merriman, Esq.

Wildman's "Bees," by Mr. Turner.

Esquimaux Carvings.
Fibre of Aloe from Jerusalem
Piece of Oak from Mamre. } Rev. J. W. Mills.

Collection of Shells, by Rev. T. W. Dowding.

## LIST OF DONATIONS TO THE FUNDS OF THE SOCIETY.

| | £ | s. | d. |
|---|---|---|---|
| C. Hodgson, Esq.,... ... ... ... | 1 | 0 | 0 |
| A. Armstrong, Esq. ... ... ... | 0 | 2 | 6 |
| F. J. H. Jenkinson ... ... ... | 0 | 2 | 0 |
| G. H. Dawson, Esq. ... ... ... | 0 | 5 | 0 |
| Rev. E. H. Fisher ... ... ... | 1 | 1 | 0 |
| A. H. Beesly, Esq. ... ... ... | 0 | 11 | 0 |
| E. F. im Thurn, Esq. ... ... ... | 0 | 7 | 6 |
| | £3 | 9 | 0 |

## REPORTS FOR MIDSUMMER, 1869.

| | |
|---|---|
| No. printed ... ... ... | 450 |
| Sold ... ... ... ... | 361 |
| Given away ... ... ... | 79 |
| No. in hand ... ... ... | 10 |
| | 450 |

# ACCOUNTS.

| Receipts. | £ | s. | d. |
|---|---|---|---|
| Balance in hand ... ... | 3 | 15 | 8 |
| Subscription from Honorary Members ... ... ... | 2 | 12 | 6 |
| Ditto from Members ... | 3 | 11 | 0 |
| Arrears ... ... ... ... | 0 | 6 | 0 |
| Donations ... ... ... ... | 3 | 9 | 0 |
| Sale of back Reports ... | 0 | 5 | 6 |
| „ Reports for Mid-summer 1869 ... | 40 | 12 | 3 |
| 2 Compositions... ... ... | 2 | 2 | 0 |
| | £56 | 18 | 11 |

| Expenditure. | £ | s. | d. |
|---|---|---|---|
| Plates to illustrate Report | 3 | 1 | 3 |
| Printing Report ... ... | 25 | 0 | 0 |
| Cabinet for Museum ... | 8 | 15 | 0 |
| Wilts Archæological Magazine ... ... ... ... | 8 | 8 | 0 |
| Entrance fee and subscription to Wilts Archæological Society ... ... | 1 | 1 | 0 |
| Aubrey's Wiltshire ... ... | 1 | 5 | 3 |
| Field day ... ... ... ... | 1 | 16 | 0 |
| Birds and stuffing ... ... | 0 | 12 | 8 |
| Zoologist and Geological Magazine ... ... ... | 0 | 11 | 3 |
| Carriage of fossils, &c. ... | 0 | 3 | 11 |
| Stationery... ... ... ... | 0 | 6 | 6 |
| Sundries ... ... ... ... | 0 | 4 | 6 |
| Balance in hand ... ... | 5 | 8 | 7 |
| | £56 | 18 | 11 |

G. E. MANISTY.
W. D. FENNING. } Auditors.

# LIBRARY.

## *ARCHÆOLOGY.*

| | |
|---|---|
| Humphrey's Coin Collector's Manual... ... ... | G. G. Monck, Esq. |
| Madden's Hand-book to Roman Coins ... ... | W. D. Fenning. |
| Aubrey and Jackson's History of Wilts | |

## *BOTANY.*

| | |
|---|---|
| Flora of Marlborough ... ... ... ... ... | Rev. T. A. Preston. |
| Sowerby's British Wild Flowers | |
| Synopsis Floræ Helveticæ ... ... ... ... | Rev. H. Baber. |
| Flora Germanica ... ... ... ... ... | Rev. H. Baber. |
| Synopsis of British Sea Weeds ... ... ... | Mrs. Gray. |
| Linnæus Systema Naturæ ... ... ... ... | Rev. H. E. Booth. |
| British Ferns (Plues) ... ... . . ... ... | A. C. Almack, Esq. |
| British Ferns (Moore) ... ... ... ... ... | Mrs. Gray. |
| List of plants within 4 miles of Rugby Close ... | F. C. Kitchener, Esq. |

## *ENTOMOLOGY.*

| | |
|---|---|
| The Entomologist ... ... ... ... ... | Rev. T. A. Preston. |
| Index Entomologicus | |
| Entomologist's Monthly Magazine ... ... ... | Rev. T. A. Preston. |
| Introduction to Entomology (Kirby and Spence) ... | W. W. Fowler, Esq. |
| British Beetles (Rye) ... ... ... ... | A. C. Almack, Esq. |
| British Bees (Shuckard) ... ... ... ... | W. W. Dayman, Esq. |
| British Butterflies and Moths (Stainton) ... ... | Rev. J. W. Mills. |
| British Spiders ... ... ... ... ... | H. A. Evans, Esq. |
| The Insect World (Figuier) ... ... ... ... | Rev. G. W. de Lisle. |
| Lepidopterist's Guide (Knaggs) ... ... ... | Rev. T. A. Preston. |
| Wildman on Bees ... ... ... ... ... | Mr. H. Turner. |
| Manual of Butterflies and Moths (Stainton) ... | Rev. H. Bell. |

## *GEOLOGY.*

| | |
|---|---|
| The Geologist | |
| Geological Magazine ... ... ... ... ... | Rev. T. Cornthwaite. |
| Handbook of Geological Terms (Page) | |
| A Paper on the oldest known British Crab ... ... | H. Woodward, Esq. F.G.S. |
| Geology for the Million (Wood) ... ... ... | H. S. Strickland. |
| On the Structure of Xiphosura ... ... ... | H. Woodward, Esq F.G.S. |
| Antiquity of Man (Lyell) | |
| British Fossil Mammals and Birds (Owen) | |
| Geological Observer (De la Beche) ... ... ... | Mr. Neate. |

| | |
|---|---|
| Primeval Man (Duke of Argyle) ... ... ... | W. W. Fowler, Esq. |
| Mineralogy (Dana) ... ... ... ... ... | J. B. Gilmore, Esq. |
| British Fossils (Morris)... ... ... ... ... | Rev. T. A. Preston. |

*ORNITHOLOGY.*

| | |
|---|---|
| British Birds (Montagu) ... ... ... ... | Rev. T. A. Preston. |
| The Feathered Tribes (Cassell) ... ... ... | A. Herklots, Esq. |
| The Ibis ... ... ... ... ... ... | Rev. T. A. Preston. |
| Eggs of British Birds (Hewitson) | |
| Ootheca Woolleiana (Part 1) ... ... ... | Professor Newton. |
| Birds of Bucks and Berks (Kennedy) ... ... ... | H. R. H. Prince Leopold. |
| Ditto ... ... ... ... ... ... | Rev. R. Duckworth. |
| Birds of Somersetshire (Smith) ... ... ... | Rev. T. A. Preston. |

*MISCELLANEOUS.*

| | |
|---|---|
| Recreative Science ... ... ... ... ... | Rev. J. M. Fuller. |
| Popular Science Review... ... ... ... ... | Rev. J. M. Fuller. |
| The Student ... ... ... ... ... ... | Rev. J. M. Fuller. |
| Intellectual Observer ... ... ... ... ... | Rev. J. M. Fuller. |
| Zoologist | |
| Conversations on Chemistry ... ... ... ... | H. M. Moule, Esq. |
| Wells on "Dew" ... ... ... ... ... | H. M. Moule, Esq. |
| "That's It" or "Plain Teaching" ... ... ... | F. C. Lightfoot, Esq. |
| Homes without Hands (Wood) | |
| Plants and Animals under Domestication (Darwin) | Miss E. Corrie. |
| Naturalist on the Amazons (Bates) ... ... ... | G. H. Dawson, Esq. |
| British Fishes (Yarrell). | |
| British Reptiles (Bell). | |
| Pictorial Museum of Animated Nature. | |
| Wilts Archæological and Natural History Magazine. | |
| Natural History of Selborne (White). ... ... | F. Madan. |
| Memoir of J. Wolley ... ... ... ... ... | Professor Newton. |
| Various Papers on Natural History Subjects... ... | Rev. A. C. Smith. |
| Report of the Rugby School N.H.S. ... ... ... | The Society. |
| „ the Harrow Scientific Society ... ... | The Society. |
| „ Wellington College N.H.S ... ... ... | The Society. |
| „ Clifton College N.H.S. ... ... ... | The Society. |
| „ High Wycombe, N.H.S. ... ... ... | The Society. |
| „ M.C.N.H.S. | |
| Eyes and No Eyes ... ... ... ... ... | Rev. T. A. Preston. |

## NATURAL HISTORY PRIZES.

THE Natural History Society proposes offering Prizes Half-Yearly for the best Essay on any particular portion of any one of the following subjects—viz., Ornithology, Entomology, Geology, and Botany.

The objects of these Essays being to call forth *facts* deduced from personal observation, the prizes will be adjudged not so much for the style in which they are written, as for the facts which they mention. *Hence every fact stated must be the result of personal observation.* This does not preclude reference to books; on the contrary, opinions or observations of others may be properly alluded to, but these must be mentioned only in connexion with the actual observation of the writer.

As a guide to what would be required, the following remarks may be useful:—

*Ornithology.*—The paper may be confined to observations on a single bird, or group of birds, the arrangement and colour of the feathers, the nesting, singing, migration, and habits, the amount of good or harm done to crops and fruit-trees by destroying insects, &c. Also any remarks upon instinct may be included.

*Entomology.*—The life-history of a single insect may be taken—the commoner the better—*e.g.*, that of the common white butterfly: and some account may be given of its external and internal structure, its ravages, the best methods of destroying it, its times of appearance, enemies, &c.

Or any particular plant may be selected, and an account of any of its insect ravagers may form the subject of the essay. The oak among trees, the nettle among common plants, will each supply a very extensive field of observation.

*Geology.*—Observations on any particular district or stratum—or characteristic fossils.

*Botany.*—Observations on any particular plant, its structure, times of flowering, uses, and products; how affected by light, heat, &c. Or the Flora of any particular district.

Or observations on Forest Trees, how affected by pruning or crowding. Savernake Forest would form a good field for study in this line.

The number of subjects therefore is very great, and each candidate can suit his own particular taste. As the essays must be the result of personal observation, no fact, however trivial, need be thought superfluous, and each candidate is expected to write his essay as if no information had ever been given on the subject. The Essays to be sent in on June 1st, and December 1st, in each year.

C. PERKINS, PRINTER, TIMES OFFICE, MARLBOROUGH.

# REPORT

OF THE

## MARLBOROUGH COLLEGE

# Natural History Society,

FOR THE

## HALF-YEAR,

## ENDING MIDSUMMER, 1870.

"Tum mihi Naturæ Libeat perdiscere mores
Quis Deus hanc mundi temperet arte domum."

MARLBOROUGH.
PRINTED BY C. PERKINS, TIMES OFFICE.
1870.

D. 29. 12. 88

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# PREFACE.

THE Society has now entered on the seventh year of its existence, and it becomes a matter of interest to see how far such Societies as ours have any real and lasting vitality. Those acquainted with University life are aware how many similar Societies terminate with the departure of their founders, and surely the Marlborough College Natural History Society must depend in a very great measure for its existence upon the exertions of those who, after a few years spent here, will leave for other scenes of action, and hand over the continuation of the Society to other and newer hands. So far, the Committee venture to think, the vitality of the Society has stood the test, though it is a matter of regret that the want of energy in the mass, alluded to in our last Reports, has not in any way been lessened. Still there are active members, and if they will only continue their exertions and bring others to such a pitch of activity that when they themselves leave, their places may be properly supplied, the Society need not fear for its existence. The Records of work done speak for themselves, and the Society may very fairly congratulate itself on having done *something*, little though it may be, to justify its existence.

The past Half-year has been a memorable one in many points. First must be mentioned the publication of the "Birds of Marlborough," by an old member of the Society, E. F. im. Thurn, Esq. The work itself is

intended for the use of the members of the School, and being written by one who really worked, when here, at Ornithology, it is put into such a shape as to be as useful to them as possible. In addition to giving such local information about the different species, as the author was able to collect, it gives a summary of all observations made by members of the School, as far as they have been preserved, and the work forms, therefore, a good nucleus for the accumulation of future records. Various circumstances prevented the sale of the book being as extensive as was anticipated, and the Committee, who naturally take an interest in a book written by a former member of the Society, in which he particularly acknowledges the benefits he has derived from it, venture to hope that members of the School will aid in preventing the book being a dead loss to the author. The Reviews of the book have been very favourable, all agreeing that it is just what it pretends to be. One remark has been made, viz., that the number of species enumerated is far fewer than can be the case, but though a few new species have been added to the list, no authenticated instance of the occurrence of any bird in the neighbourhood, of which the author could get information, has been omitted.

The circumstances which caused the departure of the School at a very important season for observations, have caused a serious interference in that part of our Report, but, on the other hand, the presence of the school here during July, has not been without its counteracting benefits. Many new species have been added to the lists, and our calendars will therefore be of their usual length.

Among the papers printed in the Report must be mentioned the one on "Bird Life." It has been written by Mr. Penrose, who, though not connected with the College in any way, kindly contributed this paper, one which is a perfect model of what such papers should be, and is certainly as important as any one which has ever appeared in our Reports. Of other papers printed, the majority are naturally by those who are not members of the School, but all will be found of interest to some, at least, of those who may like to read them.

The number of Honorary Members who have compounded is on the increase, and a consequent simplification of accounts is the result. The money derived from this source, as well as any balance in hand, is now deposited in the Bank, where it will accumulate till required for the furnishing of a new Museum, a thing much wanted, but as yet only among those things we *hope* to get at some future time. The amount of the half-yearly contribution is very small, and as a Report is given in return, the profits of the Society upon each Honorary Member amount to but a few pence; writing to apply for payment of subscription and postage of the Report diminish this profit still more, and the committee have consequently determined that no Reports shall in future be sent to Honorary Members whose subscriptions are in arrear. If, therefore, Honorary Members would kindly forward their subscription on receipt of the regular Report (when the subscription really falls due) much trouble and expense would be spared to the Society.

The Committee are sorry to say that the number of new members is not equal to those who have left the Society; no doubt the unsettled Half-year is a cause of this, which may be corrected by subsequent Half-years. On the other hand the greater interest shown in the welfare of the Society by Masters is a good sign of stability, for the Society will necessarily derive its greatest strength from those who are permanently resident here.

Prizes were offered for the best essays on observed facts. The Committee regret that no member of the Society or of the School has felt disposed to try for them.

There was one Field-day during the Half, which was unusually successful, but an attempt at a second failed, owing to the unwillingness of a fair proportion of members to take part in it.

The Committee wish to conclude by expressing their warm thanks to all Donors and others who have in any way shown an interest in the Society. A detailed List of Donations will be found in the Report, but the Committee cannot refrain from especially noticing that from Mr. Gauntlett, the Head Keeper of Savernake Forest, of male specimens of the gold and silver Pheasant.

# LIST OF MEMBERS.

**PRESIDENT:**
Rev. T. A. Preston.

**SECRETARY:**
W. D. Fenning.

**TREASURER:**
Rev. T. A. Preston.

**LIBRARIAN:**
E. Almack.

**COMMITTEE:**

The Ex-Officio Members.
C. M. Bull, Esq.
E. Almack.
J. B. Fuller.

**HONORARY MEMBERS:**

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H. M. Moule, Esq.
F. E. Thompson, Esq.
W. E. Mullins, Esq.
C. M. Bull, Esq.
Rev. J. F. Bright.
Rev. J. Sowerby.
Rev. H. Bell.
Rev. C. W. Tayler.
A. Babington, Esq.
W. Fergus, Esq., M.D.
E. J. Turner, Esq.
S. B. Dixon, Esq.
F. Storr, Esq.
W. H. Macdonald, Esq.
J. F. Duthie, Esq.
G. H. Dawson, Esq.
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A. C. Almack, Esq.
E. F. im Thurn, Esq.
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F. Bonney, Esq.
T. R. Dumergue, Esq.
R. W. Tayler, Esq.
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R. F. Isaacson, Esq.
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W. W. Dayman, Esq.
H. A. Evans, Esq.
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A. H. Beesly, Esq.
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**MEMBERS:**

E. Almack.
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*J. B. Fuller.
C. A. Sladen.
E. L. Hesketh.
B. J. Guillemard.
H. S. Sankey.
*W. D. Fenning.
*H. J. Verrall.
P. L. Hesketh.
E. H. Wyatt.
H. R. Armstong.
H. C. Spry.
J. H. R. Clark.
G. C. Mansel.
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E. A. Champneys.
E. Meyrick.
G. H. Perry.
F. Madan.
A. S. Marshall Hall.
S. C. V. Filleul.
W. J. Gardner.
H. O. Yeatman.

* Heads of Sections.

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| H. M. Moule, Esq. | J. F. Duthie, Esq. | H. A. Evans, Esq. |
| F. E. Thompson, Esq. | G. H. Dawson, Esq. | Rev. J. W. Mills. |
| W. E. Mullins, Esq. | S. Image, Esq. | E. C. Sewell, Esq. |
| C. M. Bull, Esq. | A. C. Almack, Esq. | J. Walker, Esq., M.D. |
| Rev. J. F. Bright. | E. F. im Thurn, Esq. | A. C. Hilton, Esq. |
| Rev. J. Sowerby. | G. K. Mills, Esq. | D. E. Leighton, Esq. |
| Rev. H. Bell. | F. Bonney, Esq. | W. W. Fowler, Esq. |
| Rev. C. W. Tayler. | T. R. Dumergue, Esq. | M. H. Smith, Esq. |
| A. Babington, Esq. | R. W. Tayler, Esq. | J. F. Cornish, Esq. |
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| S. B. Dixon, Esq. | R. F. Isaacson, Esq. | F. E. Hulme, Esq., F.L.S. |

**MEMBERS:**

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| J. B. Oakeley. | P. L. Hesketh. | E. Meyrick. |
| *J. B. Fuller. | E. H. Wyatt. | G. H. Perry. |
| C. A. Sladen. | H. R. Armstong. | F. Madan. |
| E. L. Hesketh. | H. C. Spry. | A. S. Marshall Hall. |
| B. J. Guillemard. | J. H. R. Clark. | S. C. V. Filleul. |
| H. S. Sankey. | G. C. Mansel. | W. J. Gardner. |
| *W. D. Fenning. | T. C. Owen. | H. O. Yeatman. |

* Heads of Sections.

# RULES.

1.—That this Society be called the Marlborough College Natural History Society.

*Constitution.*

2.—That the Society consist of Members and Honorary Members.

*Officers.*

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by members of the Society.

*Management.*

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other members of the Society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

*President.*

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

*Committee.*

7.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in editing the Report.

*Secretary.*

9.—That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the Reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee appointed by the President.

*Treasurer.*

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence that of the Secretary.

*Librarian.*

14.—That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the Donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Report of the Society.

*Library.*

15.—That any member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

16.—That if any Member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

*Museum.*

19.—That any Member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purpose of study, provided there be a reasonable excuse for their not belonging to a Section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

*Members.*

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.* to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1*s.* on election.

25.—That Members have the right to be present, to state their opinions, and a vote at all general meetings of the Society; to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the Report half-yearly.

*Visitors.*

26.—That on such occasion when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

*Honorary Members.*

27.—That Honorary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

*Suspension of Members.*

28.—That any member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

*Sections.*

29.—That Sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these Sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these Sections shall hold meetings as often as shall seem fit to the Heads of the several Sections, at which any member of the School, with the sanction of the Head of that Section, may attend.

*Meetings.*

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

*New Rules.*

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

## MEETING HELD FEBRUARY 18TH, 1870.

THE following donations were announced, and thanks ordered to be given to the donors:

"Kimmeridge Money," by Rev. J. S. Thomas. The following note was received from the Rev. J. H. Bond, of Creech Grange, Wareham, who gave them to Mr. Thomas:

"The subject of the Coal Money has exercised the imagination of a variety of persons who have discussed its possible use, and by what people.

It is made from a bituminous shale or schiste, which is found around this coast. The money (as it is called) is found in considerable quantities in different localities, some of them some miles from the coast, buried in confused heaps generally, about a foot or two below the surface of the soil. It has been doubted by some whether the remains are not Phœnician, though the original idea that it was money, has been generally rejected. The last and probably the best paper respecting coal money, was written by the Rev. J. H. Austen, and printed for private circulation amongst the papers of the Purbeck Society. His idea is that it forms the refuse of the Armillæ, or Bracelets, which were turned of this material, and which latter were frequently worn by the early Britons. There are occasionally broken pieces of these rings found with the Coal Money.

I remain, faithfully yours,

J. H. BOND."

Spoon from the South Sea Islands, by E. W. Swetenham.

Two Love-bird's Eggs, from Australia, by F. Leigh.

Slag from an old Roman iron furnace in S. Wales, by H. A. M. Power.

Stag's Horn from below the foundations of Caerphilly Castle, Cast of a Trilobite, and Fossils from Watchet, in Somersetshire, by C. R. Waldron.

Collection of Bird's Eggs, remarkable for form or markings, by E. C. Sewell, Esq.

Guillemot's Eggs and Specimens of Tin and Copper, by F. H. Thirlwall.

Coins by G. H. Perry, H. W. Simpkinson, and C. E. Down.
Specimens of Indian Paper, by H. C. Spry.
Egyptian Pipe, by H. S. Sankey.
G. H. Perry exhibited some Ammonites, and
J. H. R. Clark, a Chinese Padlock.

A. C. Champneys read the following Paper on

## FISH.

Fish are the lowest of Vertebrate animals.

The blood-corpuscles are red, as in all Vertebrata, but they are nucleated, a structure which is not found in the highest Vertebrate animals.

The heart has two chambers, an auricle and ventricle. This is the case in all fish except the *Amphioxus*, which has no proper heart, and the *Lepidosiren* or Mud-fish, which has two auricles, but it is doubtful whether this last should be classed among fish or among the *Batrachians* (Frogs, Newts, etc.)

The respiration of fishes is carried on by gills, which are usually a number of plates (fitted on to bony or cartilaginous arches), through which numbers of blood vessels run, and the blood is thus brought into contact with the air suspended in the water and purified. These gills are fitted with gill-covers, which allow the water to pass off from the gills; they are usually situated on each side of the neck.

The mouth only is used in respiration, the nostrils having no internal opening.

Fish usually lie with their mouths up stream, so that the water may pass over their gills more easily. Fish can be drowned by holding their heads down stream, this prevents the water passing over their gills through the mouth.

The mouth generally contains a great number of small teeth, but in the *Cyprinidæ* or Carps (the Carp, Tench, Roach, etc.), the bones of the throat support very powerful teeth which work against a process of the skull.

In the digestive apparatus there is nothing very remarkable except that there is a striking advance in some of the organs in the higher types of fish over the lower. Thus the *Pancreas* (an organ for supplying juices to the stomach), in the lower types has its place supplied by a number of cœcal appendages, but in the higher types of fish, the Cartilaginous, as Sharks and Rays, there is a single organ resembling the Pancreas of the higher animals very closely. In those fish which swallow their prey alive, as the Pike, the teeth are inclined backwards, so that the prey easily slips forward into the stomach, but cannot go back out of the mouth. In Sharks there are a number

of flaps of flesh hanging down in the gullet which perform a similar office. Most fish possess an air bladder which assists to balance and hold up their bodies in the water. It is sometimes unconnected with the mouth, and then probably obtains its air from the blood, but in some (the *Physostomata*, a class which includes the Herring, Salmon, Pike, Perch, Carp, and many others) it is connected with the mouth by a tube, and in the *Lepidosteus* or Bony Pike, one of the ganoid class of fishes, the air bladder is divided into cells; and in the *Lepidosiren*, which possesses lungs (and is, in fact, the connecting link between fish and *Batrachians*), the air bladder is wanting. For these reasons it is thought that the air-bladder of fish is a rudimentary lung.

In the nervous system of fish there is a great distance between the lower types and the higher. In the lower fish the cerebral hemispheres, the size of which correspond to the intelligence of the animal, are very small, but in the sharks they predominate over the rest of the brain. The nervous system of fish generally is very inferior to that of other vertebrata, and the brain is very small. The lobes of the brain connected with the sense of smell are very large. The ears are internal, but in the shark there is a trace of an external opening.

Fishes are divided into orders, the *Leptocardia*, the *Cyclostomata*, the *Teleostea*, the *Ganoidea*, the *Selachia*, and the *Dipnoi*.

I.—The *Leptocardia*. This order contains only one fish, about 1½ inches long, the *Amphioxus lanceolatus*, which inhabits the sea in places where there is a sandy shore. It is a slender transparent creature, and this allows its organs to be easily traced. Its vertebral column is represented by a gelatinous chord (the *chorda dorsalis*) which supports the axis of the nervous system (the latter in this case is only the spinal chord as far as the *medulla oblongata*). It has no brain. The head bears two eyes, and a small pit furnished with cilia, which appears to be a nostril: the mouth is placed at the front of the head, it possesses no jaws. It opens into a large branchial sac, (a sac in which the *branchiæ* or gills are enclosed), this sac opens into the general cavity of the body, the water is carried off by an opening at the under side of the body. It possesses no heart, but the large vessels contract, and thus act in place of one, and its blood is colourless. It is thus, evidently, the lowest of *vertebrata*, and it was, in fact, doubted by some authors, whether it should be placed among them at all.

II.—The *Cyclostomata*. This order shews a great advance on the preceding one. The skeleton consists of a *chorda dorsalis*, but there is a rudimentary skull; there are no jaws, but the tongue and mouth are often armed with teeth. There are several branchial sacs, which open along the side by separate holes. There is a heart composed of two chambers. These fish

are able to attach themselves to stones by their mouth by sucking: amongst others the lampreys belong to this order. There is also a small fish belonging to it, called the *Myxine glutinosa*, or glutinous hag, which eats its way into the bodies of fishes: and is the only vertebrate animal that is a parasite; it was called *glutinosa* from the quantity of mucus it can give off, which is so great that if put into a vessel of water, it will, in a short time, turn the whole into a glutinous mass.

III.—The *Teleostea*. These have a complete bony skeleton, and the skull is composed of numerous bones. The water for respiration passes in at the mouth and out at the gill-covers, which first occur in this order. The limbs are always present, that is, the pectoral fins, which correspond with the fore-limbs of the other vertebrata, and the ventral fins, which correspond, though less closely, with the hind-limbs. The other fins have nothing to correspond with them in the other vertebrata, and are not joined to the vertebral column in the same manner. This order contains several divisions, which are again sub-divided into families. I shall only speak of a few remarkable individuals of this order, as it would take too long, and be very uninteresting to touch on all these divisions. The first I shall speak of is the *Gymnotus electricus*, or electrical eel. This fish, which is about five or six feet long, is able to give an electric shock to anything it touches, strong enough to knock down a man and deprive him of the use of a limb for some hours, and magnetize steel needles. The apparatus extends along the greater part of the body. It is composed of four bundles running parallel to the vertebral column, one on each side of the upper and one on each side of the under part of the body. These bundles are composed of a number of horizontal parallel plates intersected by transverse vertical plates, and the quadrangular canals thus formed are filled with a gelatinous matter, the whole apparatus being furnished with a great number of nerves. The former part of the apparatus is positive and the hinder negative. It is said to be able to benumb small fishes at some distance from it in the water.

Dallas gives the following account of the way in which the Indians capture them. "The Indians of South America, when they wish to capture this fish, commence their operations by driving a number of horses and mules into the ponds inhabited by them: the eels, alarmed at the disturbance, immediately attack the intruders upon their quiet domain, usually applying their entire length to the bellies of the unfortunate quadrupeds, and thus giving the full effect of the whole electrical apparatus. Some of these horses soon become disabled, and, falling down in the water, are drowned; the others, being driven back by the shouts and whips of the Indians, continue the conflict until the powers of the *gymnoti* are, for the time, exhausted. They

then endeavour in their turn to escape from the scene of warfare, and for this purpose approach the shore where another enemy awaits them: the Indians, armed with harpoons attached to long cords, strike at all that come within reach, and by jerking them rapidly out of the water, so as to keep the cord from getting wet, contrive to secure their booty without receiving any shock."

There is a very singular little fish belonging to the same division, which inhabits the subterranean caves of North America. It is blind, the eyes being covered with an opaque skin or entirely absent, and its young are brought forth alive. It is a curious fact that all the animals which inhabit the inner parts of these caves, where there is no light at all are blind, while those that inhabit the outer parts where there is little light have the eyes very large. Both are thus directly adapted to their circumstances.

The structure of the *Pleuronectidæ* or Flat-fish is very singular. The head is twisted round so that both eyes are on one side, and the abdominal cavity is very small, and situated close to the head, so that the whole body is nothing but an exceedingly compressed disc-like tail. The young of this fish when hatched has its eyes on opposite sides but they afterwards become twisted to the same side. The white colour of the under side is caused, as in all fish, by the absence of light from that part. The upper and under surface of these fish are not the back and belly, but the two sides.

The common stickleback, which belongs to this order, is remarkable for the care it takes of its young, whereas most fish leave them to shift for themselves. This fish belongs to the same suborder as the perch, which includes those fish in which the first dorsal fin is supported on spines usually extending beyond the membranous part of the fin, in which case it is used more or less as a weapon. In the stickleback the membranous part of the fin is absent, and the spines form very powerful weapons. The stickleback also bears two spines one on each side of its under surface about the middle of the body. The male stickleback forms a nest of small fragments of vegetable matter, and in this the female deposits her eggs. The male keeps guard over this, and attacks intruders with great fury, trying to wound them with its ventral spines. It is said that he sometimes even succeeds in ripping up and destroying his opponent. They are at all times most pugnacious little creatures, and I once knew a "fiery" or male stickleback which killed all the other fish in an aquarium. He keeps guard over the nest till the eggs are hatched; and even then he still keeps guard over the young fry, and carries back any incautious straggler from the nest. The common stickleback has bony plates along the side instead of scales. It lives both in fresh and salt water, and abounds to such a degree in the slow streams and fens of

Lincolnshire, that it is occasionally employed as manure. The fifteen-spined stickleback, a marine species, also builds a nest.

There is a fish inhabiting the Chinese seas, whose mouth is prolonged into a kind of beak, but this is so inclosed by the skin that only a small opening is left for the mouth; this fish is in the habit of shooting a drop of water from its mouth at any insect it sees flying within reach, this nearly always brings the insect down into the water, when it can of course pick it off at its leisure. The Chinese keep these fish in basins, and amuse themselves by watching them trying to bring down a fly suspended over them by a thread.

The pilot-fish often attends the shark, and it has often been seen, when a bait has been let down from the side of a ship, to go up to it and taste it, and return to the shark, apparently to inform him that it was eatable, as he then took it. A shark was once seen, when about to swallow a bait, prevented from doing so by one or other of four pilot-fish which accompanied him, and when he had taken it and was being hauled out of the water, one of his little friends clung to his side for some time.

The climbing perch, *Anabas scandens*, found in India, often quits the ponds or streams it inhabits, and moves overland to a considerable distance. It has a sac at the base of the skull provided with numerous folds in which the water is retained so that its gills are kept moist. It can live out of water for as long as six days. It is named from its habit of climbing trees.

The *Hippocampus* or sea-horse is a very singular creature. The body is covered with bony plates instead of scales: it has no caudal fin, and uses its long tail to fasten itself to seaweeds. The bones of the face are prolonged into a kind of snout, while the male is furnished with a pouch at the base of the tail, in which the eggs are hatched, and in which the young fry are sheltered. Mr. Yarrell says that he has been told by fishermen that if the young are shaken out of the pouch into the water close by the boat, they do not swim away, but when the parent fish is held in the water in a favourable position the young again enter its pouch.

IV.—We now come to the fourth order *Ganoidea*. This order has its skin clothed with smooth, bony plates, sometimes distributed over the whole body, sometimes confined to the head; these are covered with a layer of enamel. The skeleton exhibits every degree of ossification, from the cartilaginous character of that of the *Selachia*, to one nearly resembling the bony nature of that of the *Teleostea*. They therefore occupy a position intermediate between the bony and cartilaginous fish.

The *Lepidosteus*, however, in some points approaches the *Batrachia* (or reptiles) very closely. Its air-bladder is divided into cells, and thus bears a

great resemblance to lungs. The compound structure of the lower jaw presents a close resemblance to that of reptiles. They are the most ancient kind of fish, but are far less abundant now than they used to be: the sturgeon is one of the few considerable *Ganoid* fish now existing.

V.—The *Selachia*. This order comprises the Sharks and Rays.

These are at once distinguished from those of the previous order by the nature of their skeleton, which is composed of cartilage instead of bone. They are often called cartilaginous fish. The skull, instead of being composed, as in the *Teleostea*, or bony fish, of numerous bones joined by sutures, is composed of a single piece of cartilage. The nature of their skeleton has caused some naturalists to place them among the lower orders of fish, but their general organization is so much more perfect than that of the *Teleostea*, that they are now justly placed among the highest, and above the bony fishes. The gills are different from the ordinary type in fish; they are converted into a number of branchial sacs; which open into the throat by separate slits, and usually have also separate slits to allow the water to pass off. The *pancreas* is in the form of a gland, and the brain shews a great advance of intelligence over the bony fish. Most of them produce living young; some, however, as the dog-fish, produce eggs which are inclosed in horny quadrangular cases. These have slits to allow water to pass to the young fish. When the young is sufficiently developed it makes its escape at the end near which its head is placed. These cases are often thrown up on the beach and are called sea-purses, etc. There is one circumstance in which the fishes of this order greatly resemble the *Batrachia*: the young fish before it is hatched is furnished with external gills like the tadpoles. The upper lobe of the tail is in this family nearly always longer than the lower. Some of these fish are very large, the White Shark grows to 25 or 30 feet, and the Basking Shark to 36 feet: some of the Rays weigh several cwt. There is a record of the capture of a ray, which took six oxen, two horses, and twenty-two men, to land. The common skate is a good specimen of a ray. Of course in the ray the upper and under surfaces are the back and belly, not the two sides as in the sole, etc. One ray, the torpedo, is electrical: the electrical powers of the torpedo were known to the ancients, and used for medical purposes.

VI.—We now come to the last order, the *Dipnoi*, so called because they can breathe either by lungs or gills. We may take the *Lepidosiren paradoxa* as an instance: the body is fish-like in form and covered with scales, having a fin running round the hinder part and four limbs, the first pair attached to the back of the skull. The skeleton is semi-cartilaginous. The gills are attached to three branchial arches, opening into the throat by separate slits, but having only one external opening, situated just behind the

head. An opening from the throat leads into a pair of cellular lungs, which are perfectly fitted for respiration. The nostrils open into the mouth. The auricle of the heart is divided into two, but the partition is imperfect. These creatures are found in the hot regions of South America and Africa; and during the dry season they bury themselves in the mud. The South American species, *Lepidosiren paradoxa*, is about two or three feet long: the one inhabiting the Gambia, in Africa, (*Lepidosiren annectens*), is about one foot long, and is said to pass nine months of the year in a torpid state. One of the species has external gills in the perfect state. You thus see the great advance in organization which is made as you go from the lowest to the highest orders: we proceed from fishes which have no brain, to the high organization of the brain of the shark; from fishes which have no limbs, to those whose limbs resemble those of the *Batrachians;* from those whose respiration is effected by a branchial sac, which is merely an expansion of the throat, to those which have true lungs; and lastly, as it is doubtful whether the lower fish are to be classed with the vertebrata at all, so it is doubtful whether the highest should not be classed among the *Batrachians.*

C. Sankey, Esq., and A. H. Beesley, Esq., were elected Honorary Members.

There were 56 persons present—2 Honorary Members, 18 Members, and 36 Visitors.

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## MEETING HELD MARCH 4TH, 1870.

E. L. Hesketh exhibited the Birds' Eggs presented by E. C. Sewell, Esq.

W. D. Fenning announced the Donation of Coins to the Museum, by Mrs. Merriman, E. Almack, and G. E. Manisty, and exhibited those presented by Mrs. Merriman.

The President exhibited a skin of the Three-toed Sloth, a collection of Breast-bones of Birds, and some Opalised Wood from New Zealand.

F. E. Thompson, Esq., then gave a short account of Deep Sea Dredging.

# ON DEEP SEA SOUNDINGS AND DREDGINGS.

THE present Paper is merely an abstract of a lecture on Deep Sea Soundings, delivered last January, in London, by Dr. Carpenter, at St. George's Hall.

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IT was long supposed that no life was possible below 300 fathoms. This belief was based on the inferences of Professor Edward Forbes, of Edinburgh, who first turned his attention to dredging. He explored the ocean to a depth of 230 fathoms, and observing the great diminution of life between 100 and 230 fathoms, he came to the conclusion that it would altogether cease at 300.

The first government to prosecute the task was that of the United States, which sent out Professor Bailey. He brought up from the Atlantic bed portions of "Globigerine mud," as it is called, consisting of the shells of Globigerinæ, one of the lowest forms of life: a species of the genus *Foraminiferum*. Bailey was the first to compare this mud to chalk.

Afterwards, when soundings were taken for the Atlantic cable, Dr. Warwick was sent out by the English government in the *Fox*. He took soundings in the waters of Iceland and Labrador, in parts indicating some the Gulf Stream some an Arctic Current. He brought up several higher forms of life, starfish, and small shrimp-like creatures: proving that more varied life than had been supposed existed at great depths. As starfish never swim in mid-water, but always crawl at the bottom, there was no doubt of their existing at these depths.

The Swedish government next sent out Mr. Saas, inspector of fisheries, to the Lofoden Islands and the Hardanger Fiord. The results were most surprising. He brought up an Encrinite three inches long, resembling the *Apiocrinite*, or Pear-lily of the Oolite period; also a lily resembling the *rhodocrinus* found so far back as the Silurian period. The remarkable point thus proved, was, that forms of life, supposed to have been long extinct, have never ceased to exist; these living *encrinites* though small, being the lineal descendant of the larger and earlier Stone Lilies. This discovery has therefore established what may be termed the Continuity of Geological Life, *i.e.*, the continued existence of types supposed to be extinct. Dr. Carpenter showed specimens of the lilies: they were branched like trees with long thin stems attached to stones. Mr. Saas also brought up a nautiloid similar to a forefather in the Lias. He had dredged with improved machinery, using a bag with an iron mouth, which scraped the bottom with a sweep of about a mile.

Soon after, when the French cable was laid to Algiers, molluscs, corals, and shell-fish, were found at a depth of 1100 fathoms, resembling species in tertiary deposits round the shores of the Mediterranean.

The first of Dr. Carpenter's voyages was in the autumn of 1867, (I believe), the scene of operations being from the north of Scotland to the north of the Bay of Biscay.

At this point before describing results the lecturer entered into one or two preliminary questions. And first he asked what are the conditions affecting animal life at great submarine depths. Pressure had been supposed to be one of the most important. Really, it was one of the least so. It is true that man cannot exist below the surface, at a depth of 120 ft. at the most, the pressure on the chest being too great, and circulation being interfered with. But it is not so with animals in whose bodies air does not exist as air, but only when dissolved in water. Such animals may exist under any amount of pressure: they had been found at a depth of 300 fathoms, where the pressure was nearly four tons to the square inch. The only circumstance really fatal to life was the extreme coldness of the water.

It had been supposed that the pressure would destroy the shape of the animal. Such, however, was a complete mistake. If we take first the case of an animal of the simplest form, a mere round cell filled with fluid: it must be remembered that it would be subject to equal pressure on all sides, and so the form would be preserved—the only difference would be that the creature would be somewhat reduced in size. Take next an animal with a stomach. There would be an effort made on its part to lift up the water in order to take in the food. This, it might be thought, would disturb the evenness of pressure, and derange the shape; but the food is forced into the stomach thus emptied at precisely the same rate of pressure as that required to expand the body: the balance will thus be kept and the animal's form preserved. Their conditions, indeed, are precisely the same as when we ourselves breathe in air and drink water; these substances will be driven in at the rate of 15lb. to the square inch, that is to say at the same rate of pressure exerted by the air in our bodies.

It is probable, indeed, that animals become inured to greater pressure as the sea bottom gradually sinks. A parallel instance is recorded by Sir Chas. Lyell with regard to some greyhounds taken to Mexico. The first importation soon became exhausted in coursing hares at great heights, but their progeny became habituated to the effort.

There is, however, one condition which leads to a marked reduction in the variety of species at the surface and at great depths. It is that of vegetation. Vegetation probably ceases altogether at 200ft., there not being sufficient light for its growth. Consequently below that depth there are no animals which feed on plants.

This leads to the question, on what food do animals exist at great depths?

The Crustaceans and starfish doubtless live on the globigerine mud. Now and then their stomachs have been found full of it.

But on what do the *Globigerinæ* live? Between Scotland and the Faroe Islands there are two zones of temperature at the sea bottom, a warm zone of 45°, and a cold one below 30°. During the voyage of 1868 little animal life was found in the cold belt: but in 1869 an improved mode was found for sweeping the submarine ground with tangles of fresh hemp covered with tar. They came up loaded with tons of animal life, while the dredge was hauled up empty. It was then found that the cold bottom was as rich in life as the warm: but not the same life. The *Globigerinæ* were replaced by sponges of an entirely new order. These sponges, however, were essentially similar to the Globigerinæ: both approaching the simplest and lowest condition of organized life, in other words being little removed from what is called protoplasm.

Now it was long known to chemists that salt water contained a large amount of protoplasmic, organic, or animal matter. It was however believed to exist only near shores, and was regarded as a diluted sewage. In 1869, however, Dr. Carpenter partly analysed salt water taken at all depths and all distances from land. The result showed that all sea water contains nearly an uniform amount of this animal matter. Just therefore as the foraminiferæ secrete lime and silex, so, probably, do these sponges and lowest creatures absorb the ocean protoplasm.

A further question of course remains, What is the source of this animal matter thus equally diffused? The ocean, it must be remembered, is teeming with life, animal and vegetable, and no single animal but exudes a slime. This animal matter becomes diffused through the sea, while the low temperature and deficiency of oxygen below retard its decomposition.

But it has been found that oxygen abounds in surface waters, carbonic acid at great depths, and it may be asked how life below is possible under such conditions. In the first place the excess of carbonic acid gas below is due to the respiration of animals. In the second place, by a well-known chemical law, all gases tend to mix with each other,—the oxygen descending and carbonic acid ascending,—so that life is thus rendered possible.

The lecturer proceeded to speak of and exhibited some specimens of creatures brought up from these astounding depths. First he showed a most beautiful sponge of flint which was fished up from the warm area, near the Manillas. It was like an inverted pear with a cup-like mouth covered with hair, below was a filamentous root descending into globigerine mud for two or three feet; this had been named "Venus' Flower Basket." Next was a sponge from Japan, with a body like a spindle, and a long filament like glass. After this he shewed some microscopic jelly-bodied creatures of all

shapes, star-like, circular, and cylindrical, which selected grains of sand and other materials of different shapes and hues, and arranged them for their outer covering with the most exact and artistic precision. One substance was chosen for the limbs, quite a different substance, consisting of sponge spicules for the lining of the mouth; in the same way with the colours, here and there it had painted itself with gorgeous quartz sand grains arranged in patterns, which for design and brilliancy would have put to shame Solomon in all his glory.

In conclusion the lecturer emphasized the two geological inferences which his discoveries had led to. First, that mentioned above, of the continuity of geological types; secondly the continuity of geological deposits. The evidence shewed, in his opinion, that the Cretaceous formation had never ceased for an hour, but had been going on from its first formation, and was still forming on the Atlantic bed.

After this the President read the first chapter of a Paper on "Bird Life," written for the Society by the Rev. J. Penrose, which appears in another part of the Report.

E. T. P. Cambridge was deprived of membership for non-payment of subscriptions. F. Madan and A. F. Marshall Hall were elected members.

There were 45 persons present: 5 Hon. Members, 21 Members, and 19 Visitors.

## MEETING HELD MARCH 11TH, 1870.

THIS was an extraordinary meeting, that the Society might avail themselves of the kind offer of Mr. Whittall, who delivered a lecture on Phrenology.

There were 77 persons present: 1 Hon. Member, 21 Members, 3 Medii Socii, 52 Visitors.

## MEETING HELD MARCH 18TH, 1870.

*Geology.*—G. E. Manisty exhibited some Coral Limestone, and H. J. Verrall some Lignite (presented by H. P. Dixon, Esq.), Fossils from Coal

(presented by Mr. Phelps), a Geological Map of Marlborough (presented by G. E. Frere, Esq., F.R.S.) and a very fine Belemnite (presented by H. C. Tillard).

*Archæology.*—W. D. Fenning exhibited the coins presented by E. Almack and E. M. R. Edgell, and A. C. Champneys an old Edition of Horace.

*Ornithology.*—E. L. Hesketh exhibited some Tawny Owl's eggs, laid about March 1st; a variety of the Quail, (*Coturnix Vulgaris*), presented by E. F. im Thurn, Esq., and a specimen of the Little Gull (*Larus minutus*), picked up on Rockley Downs.

*Entomology.*—H. Manders read a list of Notices, and F. J. H. Jenkinson exhibited a specimen of the very rare Crimson-Speckled Footman (*D. pulchella*), taken last year near Reading.

*Botany.*—The President read a list of Notices, a very small one for this time of year.

The President then read chapters 2 and 3 of the paper on "Bird Life."

There were 27 persons present, including the Master, viz.: 2 Honorary Members, 13 Members and 12 Visitors.

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## * BIRD LIFE.

### Chapter I.—The Daily Life.

There is no animal *in rerum naturâ* which knows better how to make a good use of its time than birds do. For them the longest day is scarcely long enough, and the shortest night is altogether too long. To give up half their life-time to sleep is a thing which they cannot understand. They must be cheerful and merry as long as they possibly can.

Therefore all birds wake early from their nightly sleep. Scarce does the dawn of a midsummer day glimmer like a shining stripe in the East, when they raise their voices one after the other, and when the morning sun first gilds the tops of the trees, the woods and meadows have already resounded with their united choir. The first sign of Nature's awakening is the note of the cuckoo in the forest, but presently the song-thrush and the redbreast join in with their liquid melodies, the goldfinch and chaffinch strike in with their full song from the young spruce-firs, the black-cock's spring call rings out from

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* Translated, with scarcely any alteration, from some papers by Herr Robert Collett, Christiania, which seems to be a translation into Norwegian, and an adaptation to Norwegian ornithology, of "Das Leben d. Vogel," by the German ornithologist Brehm.

the bare hill-sides, and the golden-crested wren's weak but pleasing strophe, the titmouse's cheerful decoy-note, and the tree creeper's pipe soon sounds from nearly every tree, whilst the chiff-chaff and the willow warbler indefatigably renew their monotonous note far and near. In the more open ground the cuckoo is also the first to make his voice heard, soon after begins the lark's full song to sound through the open air, the fly catchers and swallows welcome the day with their lively twitter to the best of their powers, while the redstart, the most unwearied of all our songsters, who has not ceased till just before midnight to sing his song, which was heard the live long day from the leafy tree tops, the whinchat, the wheatear, all these and more have long ago made known the gladness of their lives, when the sun shows himself above the horizon.

All sing their morning song fasting, and go forth in search of food first after the sun has risen. The swallows skim backwards and forwards over the meadows, thrushes, finches, larks, starlings and pigeons descend upon the fields, the fly-catchers and warblers look about them among the foliage, woodpeckers, titmice, golden-crested wrens and creepers hop and climb from bough to bough, in a word they all in the fields, in the forest, in the bushes and by the brook side, seek their daily bread.

Most of our birds seize their food with the bill, and the raptorial birds alone use their talons. The woodpeckers spit the insects which they discover in the crevices of the trees on their pointed tongues, and in this manner thrust them down into their gullets, the wryneck sticks his long snakelike tongue into the anthills, and does not draw it back till it is well covered with ants. The birds that have a wide gullet let large morsels or whole living creatures slip down bodily; in this way cormorants and gulls swallow fish a foot long, the eagle and eagle-owl large bones, and the night-jar the largest beetles and night-moths. Some of the longest beaked Waders, such as herons, toss their captures into the air, and catch them in their open mouths.

Birds of prey and some others throw up the undigested parts of their food, as hair and feathers, in the shape of round pellets. But this is not done without considerable effort; an owl on the point of doing this presents a sorry sight, as he turns and twists his head in every direction, moves his wings and legs convulsively, and gives manifest proofs that his situation is by no means a pleasant one.

Some birds keep what is over after a meal till a later opportunity, or lay up storehouses for winter. This last is the case with nutcrackers and nuthatches, both of which collect great quantities of nuts for winter use, whilst the great grey and the red-breasted shrike spit insects and other food on the thorns of various trees, to be able to consume them when the weather is bad and game hard to get.

All the birds that live on carrion, fish and vegetable diet require a great deal of water, insect eaters drink less, and birds of prey often none at all for a long time. Swallows and some sea fowl drink as they fly, and sea-fowl salt water as readily as fresh. All birds drink as we see our tame poultry do, namely by taking a drop in their beaks and raising the head so that the water may run down the gullet.

As soon as the bird has got enough food and drink, away he flies to a safe place, and sets himself to rights, in order that the business of digestion may proceed properly. During this he subsides into a state of quiet enjoyment, and some are so occupied with themselves and their digestion that they even forget their own security. Thus some voracious birds of prey, when they are thoroughly gorged, let the shooter come quite close to them, or almost allow themselves to be seized by the hand. In fact every bird, when gorged, loses its activity and liveliness more or less, and this is the cause of the stillness which at midday prevails in the forest.

In the afternoon this doze is over, hunger demands its rights again, and the bird must once more think about victuals. Whilst the insect eaters feast as long as the sun is in the sky, many seed eaters are contented with two principal meals, and most birds of prey find one enough provided that they have had a sufficiency.

The life of birds is a true reflex of the sky. If the sky is clear, the bird is merry, but if the weather is unsettled, the bird also is out of spirits. On rainy and cold days the search for food takes up all his time, and then his song is silent, but if the weather is thoroughly bad then the bird gives up seeking food altogether. No bird besides the swallow, the pigeon, and most water fowl turn out in rain as readily as in dry weather.

Besides digestion the bird goes through another important business during the middle of the day. Most birds are clean creatures, and only the Woodpeckers, which smear themselves with gum, tree-creepers which stain themselves gray on the wet stems of trees, and the golden-crested wren, which in rainy weather becomes quite black from a species of lichen which grows on the spruce firs in the northern forests, make sometimes, but for only a short time, an exception.

But this cleansing takes a great deal of trouble, and in fact not many minutes pass without the bird trimming itself. For this purpose it often makes use of either a dry or a wet bath.

The dry bath, which we see our tame poultry and the common sparrow use every day, is a powerful means of getting rid of all manner of parasitical animals. The water bath is taken in various ways, some sprinkle their feathers quite lightly, while others wet themselves thoroughly, so that they can scarcely fly. This is particularly the case with the finches and thrushes. All

land-birds bathe by wading into a shallow place, and produce a dense shower by strokes of their wings; the water fowl wash themselves in the water itself. Bathing is a necessity for almost all birds, and they sicken and die if they go without it.

After bathing the bird trims and dries his feathers carefully, and after they are set in order they are oiled, in order to withstand wet, with the fatty secretion contained in the gland on the rump. The bird presses out with his beak a drop of this oil and by means if its extremely flexible neck it anoints the feathers of the whole body, except those of the head; these are at last so well rubbed against the breast and wings, which are already anointed, that they soon receive the necessary quantity of the oil.

When the cleansing process is at last completed, the birds enjoy a spell of unmixed enjoyment of warmth within and without. For this purpose many birds sit enjoying a long leisure on a projecting bough, and sun themselves; gulls take up a position on the sheltered sides of skerries, and cormorants set themselves in long lines on the warm walls of rock, and gently wave their wings.

When the storms of autumn roar out of doors, and the night is cold and wet, while we ourselves are sitting in our warm rooms, we now and then think of the birds that are forced to spend the night out, and to sleep under the open cold sky. But when we console ourselves with the idea that they pass the night in their nests, there is more of comfort in this for ourselves than for them. Besides the common sparrow, and its cousin the tree sparrow, together with some of the woodpeckers and birds of prey, they one and all leave their nests at the end of the breeding season, and pass the night as best they can, huddled together on a bough near the stem, or in a thick bush.

Most birds sleep singly, but some flock together towards evening in great companies, and spend the night at a regular sleeping place. Thus rooks have usually their night-quarters in some particular trees in a thick grove or corner of a wood. They come hovering stilly and silently as soon as the dusk has set in, sometimes singly, sometimes a number in scattered companies, and arrange themselves. Not so silent are the starlings, these choose the thick reed-bed that covers the banks of still waters, or, when this is not to be had, spend the night in a thick tree-top. They come flying in close flocks, fly for a time to and fro over their sleeping place with whistling wings, and only come to rest at last after a long screaming, chattering, and noise. Some smaller birds, such as yellow-hammers, pass the night in flocks in thick bushes, where they assemble bit by bit in the course of the evening: here also the twittering and noise goes on incessantly till at last the disturbance gradually ceases, more and more of the little beaks disappear under the wings, and by midnight all is still.

Sleep is short and light among them all. Many waterfowl, especially the long-legged waders, sleep standing on one leg, concealing the other among the feathers of the belly, many swimming-birds sleep on the water, and keep themselves against wind and stream by an unconscious paddling with their feet. The nightjar sleeps lengthways along a bough, the woodpeckers within their holes, where they hang in a climbing position on the inner wall of the hole. Many waders prefer to sleep standing half out in the water.

The slightest disturbance of their night-rest deprives them altogether of their self-possession. Most utter a frightened scream, and fly right out into the air; others do not venture far, but settle themselves to sleep again as soon as they can. Some do not sleep at all after any such disturbance, but fly about restlessly the whole night.

Birds too can dream, which one may pretty often observe in those that are kept in cages. What they dream of one cannot well say. In spring and autumn one may see them flutter in their sleep, and then, no doubt their thoughts fly out upon the long migration to the far-off south.

## Chapter II.—The Pairing Season.

Spring is the bird's festival—arrayed in their nuptial dress, singing and jubilant one after another the migrants return. All the old birds revisit their former dwellings, and the young birds mate and take a new one.

But it is not given to all to live with a mate, many spend the summer in single blessedness. These supernumeraries are nearly all cocks: they rove about all summer time without a home, ever ready to fight for a hen, or to comfort a sorrowing widow. And there are many instances of such a widow taking her loss easily: one morning in the garden of the Parsonage of Etne* one of the magpies belonging to a nest was found dead, probably from having eaten part of a poisoned fox, but in the afternoon of the very same day came the other bringing up a new spouse. Hens are less easily replaced, and this seems to be the reason that there are more single males than single females in nature.

Most birds have their own especial way of making themselves agreeable to their hens, and this manifests itself not only in their voices, but also in their peculiar movements. Birds of prey float by the hour in company with their mate under the blue heaven, and perform the most beautiful evolutions as they fly, the nightjar floats with active turns backwards and forwards, and its otherwise noiseless flight is accompanied by a drumming sound; the

* In Bergenstift, in Norway.

common bunting, the larks, and others, have at this time a wonderful manner of flight, with their feet hanging down and their wings quivering, as if they could not fly properly; the wagtails and common sparrows dance and hop before their chosen ones, as we have often seen: the titlarks, the wheatear, the whitethroat, and some others, rise from a stone or bush singing into the air, and sink down again in a slanting direction to the same place; the common snipe makes its extraordinary bleating, which does not proceed from its throat, but from the vibration of its tail-feathers as it sinks in its flight; the ducks swim round as if they were half-mad, half above, half under water, with their bodies flattened and wings spread, and all these movements are to win the hen.

These energetic expressions are especially conspicious in the gallinaceous birds, and most particularly in the courtship of the capercaillie and the blackcock. In the case of these birds the attachment between the pair is but feeble, seeing that they live in polygamy like tame poultry, but at the pairing season this instinct is all the more powerful. The courtship consists of the love-song and dance with which the male endeavours to awaken corresponding feelings in the female, and his powerful tones resound like an echo from the whole of awakening nature in the young spring day, through all the forests of Scandinavia.

The ruff, that long-legged snipe-like bird, whose long neck is adorned in spring with a ruffled collar of feathers of all conceivable colours, goes still farther, he takes his stand like the knights of the middle ages, and goes through a sham-fight to win his love. The champions encounter each other in an appointed place; with levelled lance and lowered wings they rush at one another, but the blows are parried by the great ruff, which stands out on all sides like a shield. No blood is shed in these battles, at the worst a feather flies off, and the contest is over, and peace and friendship again established between the combatants. The outward and visible homage of the cock for the other sex can find no more beautiful nor complete expression.

But not only by these and by other movements, but by clear and intelligible words does the cock make known his tender feelings. This is why the song of birds is strongest and most beautiful in spring, but is silent when parental duties take up their time, and the mates are after that separated. Thus the cuckoo, the landrail, and wryneck, become almost invisible when pairing time is over. In spring-time the nightjar utters a hoarse and ill-sounding shriek, which it never allows to be heard at any other time, the jay makes music in the most wonderful keys, and some of the smaller birds, that at other times do not sing, as the grey flycatcher, and the red-backed shrike, every now and then, but very seldom in the neighbourhood of a man, give utterance to a short and musical strophe, which is their proper song.

The black woodpecker testifies to the same feelings, when on bright spring days he produces on a dry tree stem the strange trumpeting sound, which has just the same effect upon the hen as if the bird had the gift of song. In short, every species has its peculiar movements, its peculiar modulations of voice, and endless other ways with which it seeks to show to its favourite the strength and heartiness of the love which he cherishes for her.

If an unauthorized stranger tries to approach the place where the cock is trying to win himself a mate, he is received with beak and claws, and a battle is the immediate consequence. This battle is fought out, according to circumstances, in the air, in the water, or the field, and often in all three at once. The eagles and falcons dart round one another like lightning, so high up in the blue sky, as almost to disappear from human eyes. The water-ouzel and several other warblers will not endure an individual of their own species in the neighbourhood, and every one that comes near is looked upon and attacked as a rival. But other birds, such as the common sparrow, starlings, and many others, take this business more lightly and treat each other with a freedom which often degenerates into weakness.

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The capercaillie and blackcock live, as every one knows, in polygamy, the cock having a number of wives, while the contrary, polyandry, is the case with the cuckoo and the ruff and reeve, one hen being the object of several cocks attention at the same time. It is supposed that the cause of polygamy among

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The capercaillie and blackcock live, as every one knows, in polygamy, the cock having a number of wives, while the contrary, polyandry, is the case with the cuckoo and the ruff and reeve, one hen being the object of several cocks attention at the same time. It is supposed that the cause of polygamy among

birds is an excess of food consequent on a want of exercise. Hence we see that ducks and geese, which are monogamous in a wild state, become polygamous in captivity with abundance of food.

As soon as the birds are fully developed, which in the smaller species is the case in the second, in the larger not till the third and fourth year, they mate, and the only exceptions to this are sometimes certain birds of prey and gulls, which often form a union while still in their younger plumage.

The pair cling to one another in life and death with a touching affection. Thus the ravens, jays, and finches, when they have once come together are seldom for many minutes separated. But if one of the two dies the hen is the first to get the better of her sorrow, and her widowhood, as we said before, does not last long. But if the hen dies, the almost certain consequence is that the other remains solitary the rest of the year. In this case the sorrow for the lost is visible, and it often happens that the survivor will not leave his dead mate, but remains sitting by the little corpse till he is driven away.

Among all polygamous birds is the attachment between the cock and hen very weak. As soon as the hens are at rest under the shelter of a spruce fir or a juniper, the cocks betake themselves into the deepest parts of the forests, where they spend the summer, hidden, and shunning the whole world, and it is not till the beginning of autumn, when the young are full-grown, that the father again returns to his family, and honours them for the future with his company. Several of the ducks do the same; the drakes collect into large flocks at the beginning of the hatching season, and live a jolly bachelor life far away from wife and children; thus the eider-drakes make off to the sea, and do not shew themselves along the coast till far on in the summer.

Another consequence of the polygamous tendencies of certain birds is the hybrid forms which rove about our forests. Thus the bold blackcock not only visits the hen of the capercaillie (*Ror*), when her proper lord and master has either been shot or happens not to be at home, but even goes altogether out of his own family and visits the hen of the willow-grouse (*Lirype*). In the first case comes a hybrid (*Rakkelhan*) of which the male is a cross between the capercaillie and the blackcock, and the female is just like a small Ror, in the latter case the rare Rypeorre, which is pied, and resembles both a blackcock and a grouse. Such hybrids have been also observed among some of the finches, swallows, and ducks, but, fortunately for science, they are the greatest rarities.

In the cuckoo the tie between the sexes is still weaker, and is entirely broken off when the breeding season is over. The cock troubles himself no more about the hen, and she no more about her eggs, and so with these birds every trace of family life disappears.

## Chapter III.—Nest Building.

If there is any part of a bird's life which is more likely than another to attract every one who has an eye open to nature, it is the time of laying eggs and building nests. Even among birds can love create artists; the cock gives the rich gift of his song, the hen contributes the capacity for constructing a cradle for her young.

Almost all birds have their distinguishing characteristics while building their nests, and their individuality is never more conspicuous than it is just during this the most beautiful time of their lives.

Usually every species builds its nest in whatever seems the most convenient place, without troubling themselves about other birds of their species. Many however in the breeding season gather into great flocks, and breed in society at the same place. Among land-birds is this especially the case with the swallows and fieldfares, but the swimming birds far surpass even them. Gulls, cormorants, auks, puffins, and guillemots breed in innumerable swarms on the same bird-rock. These bird-rocks, on which nest lies close to nest, and bird sits close to bird from the top of the rock down to the surf forming at its foot, are very numerous among the perpendicular cliffs of Finmark and Nordland, and on some parts of the coasts of Great Britain.

Comparatively few birds use their nest more than one year. Most, as soon as the young are flown, treat it as if it did not exist. Only the swallows, individual woodpeckers and birds of prey, sparrows and starlings, use it regularly year after year.

Every bird chooses for its nest the place which seems best to suit its own peculiarities and manner of life, and one scarcely can find a place high or low, by waterside, or on land, in forest or field, in copse or on mountain, which they do not use. All endeavour to keep the nest out of sight, but they do not all do so in the same way, but, if possible, they contrive that it shall be naturally protected, either by its resemblance to a tree or to the ground on which it rests, or by hindrances which the bird conceives to be unsurmountable to its enemies.

In the choice of its nesting place the bird carefully takes into consideration all the circumstances and dangers which can have an influence on its nest. But it sometimes happens that she miscalculates; thus the water-ouzel builds her nest so low on the river-side that it is carried off by a spring-flood, and the redstart and the white wagtail often build their nests on the scaffolding of a building under construction.

From some inexplicable reason birds now and then choose their breeding place just where one would least expect it. The garden-warbler often builds in a bush which stands so near to a frequented road, that every one who passes by must needs see it. A fly-catcher's nest has been found in the

handle of a spade hanging on a peg in a tool-house; the hen allowed the nest, when the spade was wanted, to be taken away and laid on a shelf just by, provided that it was put back again into its place, when the spade was again hung up against the wall. A redbreast chose a still more extraordinary breeding-place, and built a nest in a bag which was hanging in an out-house, and in which a gardener kept his tools, but the gardener, who could not do without his tools, and would not on any account disturb his little tenant, made just such another bag, shifted the nest, eggs and all, into this, and hung the whole up in its place, in which arrangement the bird entirely acquiesced. Another pair of redbreasts built in a garden-engine, that hung from the bough of an apple-tree, and one took up its abode in a carpenter's shop, without being disturbed by the noise and din of the many workmen, and built the nest of the nearest materials, to wit, shavings.

Seldom do birds settle quietly in a place in which the usual conditions for a convenient breeding place are wanting: but it sometimes happens so, and in this case the bird seeks out the nearest things that will answer the purpose. On the high mountains, where there are no steep sand banks, the sand-martin digs its horizontal tunnels in the roofs of the Sæters* in districts bare of trees, as in Jæderen† the magpies build in bushes or on the roofs of the houses, and the Hooded-crows, elsewhere so shy, take up their abode either on the ground, or the few stunted fruit trees that may be found round the farm-houses, often quite close to the walls of the living-rooms.

No bird likes to be disturbed when building. Many desert the nest at once, when they see that they are discovered, especially is this the case with the wren, which almost always makes off if one, only for a second, stands and watches them while building.

Generally birds build only in the early morning, when they have no particular cause for haste, and even then all work is stopped during rainy weather. Swallows are obliged to work at intervals in order to let the finished part of the building dry sufficiently; and here they have to practise patience, which indeed, in long continued wet weather is often put to a severe test.

One can draw no conclusion from their nests as to the resemblance and mutual relationship of species. Thus some ducks breed on the bare ground, others in holes which they dig for themselves, others again in hollow trees; some titmice lay their eggs in a plain nest in holes in trees, others build among the boughs, and these belong to the most elaborate nests we can point out. Thus the nests can in one way only be arranged according to their situation and construction.

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* Summer dwellings of the girls who tend the cows and make cheese on the high mountains all over Scandinavia, just like the chalets in the Alps.

† In the S.W. corner of Norway.

If one observes birds while engaged in building, one sees at once that the real builder is the hen, the cock being, in general, nothing more than, as it were, the hodman; sometimes he does not even help in the collection of materials, but leaves the whole business to the hen. This is the practice of the garden-warbler and the chaffinch, which employ the time, while the hen builds, in cheering her with their song, but never are allowed to touch the nest. In the case of the Shoveller duck, and doubtless several other of the duck-tribe, the duck seems to hide the nest with the greatest care from the drake who would otherwise never leave her in peace during the hatching season. Among some birds however, *e.g.*, the swallows, the cock faithfully assists his mate in the building of the nest.

The component parts of the nest are brought, in preference, from the neighbourhood, when possible. Thus if the spotted flycatcher, a bird nowise fastidous in the matter of nesting place or materials, has taken up her abode in a yard, either under a tile, or in a hole in a wall, she prepares a nest, which may be composed at once of bits of wool, straws, feathers, scraps of cloth of all sorts and sizes, bits of paper, threads all different kinds, even bits of wire, &c. But the bird has often to fly no little distance when some particular substance is required and which is not easy to be found. Thus 99 times out of 100 the nest of the Siskin is lined with the white down from catkins of willows; the long tailed titmouse with black-cock* feathers, and the chiffchaffs with horsehair.

Raptorial birds alone carry their materials in their claws, all the rest in their beaks. Dry twigs are mostly gathered in the open field, but are also broken off from the trees, as we see rooks and starlings do, these birds are also so clever that they are up to using the loose twigs in their old nests. Lichen and moss come from the nearest trees, feathers are often caught in the air, or collected on the places where a bird of prey has devoured a small bird. In the northern parts of Scandinavia the small birds make use of reindeer's hair and grouse's feathers.

In various different ways does the bird set about fastening, plaitting, and binding together the nest materials. The longer stalks of grass, fibres of bast and threads she winds round the bough by flying round it, the single small pieces are first moistened with her sticky spittle, and are then carefully pushed in and made fast. Lastly the inner surface of the nest is, by means of the feet and a swift turning-round of the body, made smooth and round, the breast being thrust against the upper edge of the nest, and now is the house pronounced by the builder ready to be occupied.

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* The reader must bear in mind, especially in this chapter, that these papers were written from the Scandinavian point of view.

The simplest nest which we know of is the nightjar's, which can scarcely be said to exist at all. The eggs, quite unsheltered are laid on the bare ground, but are nevertheless secured from discovery by the colour of the bird and the eggs, which agrees exactly with the ground on which they rest. Some of the owls and birds of the auk family scarcely do more; the Skua-gulls, the Terns, and our wild forest-grouse* just scrape a hole in the ground, or put a couple of stalks of grass together as an apology for a bed for their eggs. The Willow grouse, † the Looms § and Gulls put together a simple bed of grasses, and some of the Waders show also a certain sort of instinctive skill; such is the hollow in the sand which the little Ringed Plover chooses as a lodging for its eggs, beautifully laid with little bits of white mussel-shell, and small round stones, quite like a variegated mosaic.

Those birds of prey which build upon the ground, such as the Short-eared Owl and many Falcons, build a true nest of twigs and long grasses. The Landrail is one of the best nest builders among our waders, and lines its nest with grass and reeds. All the Anatidæ build large and warm nests, the Swans, which breed on the lakes and rivers of Finmark, get together such a prodigous nest as to bear a man without sinking. The Geese do not take so much trouble, but still fill their nests with down like the Ducks. These last employ this material in such abundance that they surround the nest with quite a rampart of it, and sometimes, as is the case with the Eider ducks, only just let a glimpse be caught of the head of the sitting hen.

The best builders of nests on the ground are the small birds, such as the Larks, the Yellow hammer, the Titlarks, and sundry other. All these twist grass and hair into a most complete nest; the Willow Warbler and the Chiff-chaff however arrange it with greater art, seeing that these birds furnish it with a vaulted roof and line it softly with feathers and moss.

One can observe equal eminence in skill in the species which breed in holes in the ground or in trees. The owls take possession of a natural or artificial hole, and there lay their eggs without anything beneath them, on a bottom of stone, earth, or wood as it may chance to be. The Puffin, the Shell-drake and the Sand-martin hollow out their holes in the ground, their eggs lying within on grass. The Wheatear, the Pied Fly-catcher, the Starling, the Redstart, the Tree Creeper and several of the Titmice breed in holes, which they seek out, but construct even here a tolerably artistic woven nest. Other

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* viz. Capercaillie, Black-cock, Hazel-hen (Tetrao bonasia).

† Lagopus subalpina very like our Grouse.

§ Blackthroated and Redthroated Divers.

Titmice excavate themselves a nest-hole in rotten tree stumps, and next to them come the master builders in this particular art, the Woodpeckers, which hollow out a regular and beautifully formed abode in the inside of the stem of a dead tree.

A peculiar family, closely related to the Geese, viz., the Grebes build a nest partly or entirely floating. Their nest, of water-plants twisted together, rests commonly on a floating piece of wood or the like, but lies mostly so low, that the water finds its way in, and quite surrounds the egg, so that it is quite impossible to understand how they can be hatched. The same is often the case with the eggs of the Looms.

The most indifferent nest of all the birds that breed in trees is that of the Ringdove. This consists properly of twigs irregularly put together, so loosely twisted together that the eggs can be perceived from below. The nests of the Garden-warbler and the Whitethroat are thin and poorly-built, and weakly fastened to the bushes or the tall plants in which they are built.

Birds of prey build better, and yet they, when they can, avail themselves of an old common crow's nest as a foundation; the nest is flat, but built so large that one end of it forms a dinner table on which their food is served to the young birds. Birds of the crow kind attain a still larger measure of skill, the Siberian jay (*Garrulus infaustus*) weaves a beautiful and smooth nest of lichen from the Spruce-fir, of moss and feathers, and the Magpie, with its cosy dwelling with an arched roof, is quite an artist.

But far beyond all these, come those whom we are about to mention. The dexterity of the fore-mentioned birds can go no farther, and their performances can be executed to a certain extent, by the handiwork of man, but a peculiar cement enters into the composition of the nests that we are coming to which can be produced only by the bird itself, namely, its spittle. These classes of nests we will divide into two main divisions, according as glueing or weaving is mainly employed in them.

We may consider our Thrushes as beginners in the former of these two methods. These form a foundation of cemented earth, and clothe this with dry grasses and leaves; the song-thrush makes the best work of these, the inside of whose nest consists of a combination of earth, chips and spittle, as hard and smooth as a cup. The Nuthatch, that blueish little bird that climbs about the trees as nimbly as a fly, and whose habits place it between the two birds from which it derives its Scandinavian name, Spet-meisen (Woodpecker-titmouse) employs the earth in a different way. It finds out a good hole, preferring one made by a Woodpecker, but as the entrance is invariably too large, it builds up the opening with a coating of earth or clay often two inches thick, and this is so hard, that it can scarcely be cut with a knife, and leaves a hole no larger than the little bird can itself slip through.

But the master-builders in this department are the swallows. We have all seen how the swallows and Martins build their half-cup shaped nests, the former inside buildings and barns, the latter outside. These nests consist almost entirely of clay, which they glue together, and fasten to the often perpendicular beams and cornices. The swift, that black, screaming bird, that skims in great flocks, with a whistling flight, round churches and high buildings, never comes down to the ground, for its wings are so long that it cannot without help rise from it, and its feet so short and undeveloped as to be of little use except to cling with, so that it cannot collect clay in this manner. Unless therefore the swift can make itself master of a sparrow's nest, no matter whether an old one or one occupied, in which latter case the young sparrows are without remorse thrown down to the ground, it plasters up for itself a nest principally of spittle and whatever other materials come to hand. And this forms a transition to the well-known Indian swallows, whose nests, which come entirely from the bird's own throat, consist of a gelatinous mass, which hardens in the air, and forms the eatable bird's-nests.

It is, however, among our weavers that we find our most scientific nest-builders. Most of the finches may be considered master-builders, and every one who has seen a chaffinch's nest, must admit that he can scarcely imagine a more scientific nest. The chaffinch plats moss and dry grass together, and on the outside covers it with little bits of lichen and the white membranous bark of the birch, all fastened together with cobwebs and the bird's own spittle, and with this covering it is so like the lichen-grown bough on which it rests, that it often escapes the sharpest eye. The inside consists of a thick layer of warm materials, such as feathers, moss, hair, wool, and fur, from animals and plants, &c. But all is so smooth and so cleverly woven together, that one must use force to tear it in pieces.

In middle Europe is found in great abundance a peculiar kind of warbler (*Calamoherpe*), very rare in Scandinavia, but nevertheless found here and there as far up as Finmark. This bird fastens its basket-shaped nest among reeds and rushes, so that it hangs with nothing between it and the water, merely fastened on each side to the weak reed-stems. The *Yellow-breasted Warbler (*Sylvia hypolais*), her match both in singing and nest-building, forms a charming nest among the thinner branches of a bush or a low tree, which resembles the chaffinch's, but externally is quite white with the finest birch-bark, and is so tightly woven together with spittle and cobweb as to form an almost hard bowl. Here, on a bottom of dry grass and feathers rest its rose-red black-spotted eggs, which are unsurpassed in beauty by any of our native species.

* Not British, but British ornithologists have given the name of S. hypolais to the Chiff-chaff.

Still higher than these stand the golden-crested wren, the water-ousel, and the wren. The nests of these are as round as cannon-balls, and are furnished on the side with a narrow entrance hole. This they all place in the most hidden spot in the place they live in. The golden-crested wren weaves it of moss among the fine pendulous spray of a spruce-fir, and conceals it entirely among the needle-leaves. The water-ousel fastens hers among the fissures of rocks, or the beams of an old disused saw-mill, invariably well hidden among ferns and grass, and, when possible, in preference, on places that hang over a foaming waterfall; and the wren, that little elf among birds, with his little stump of a tail stuck upright, forms its scientific nest far in among the hanging roots in a landslip or hollow way, its constant resort, and where, like the ousel from the river bank, it lets its song be heard at every season, in the bitterest winter cold, as well as in the sunny spring days.

But none of our native birds build so clever a nest as the Long-tailed Titmouse. The bird itself is the most graceful creature one can conceive, and when it flies from tree to tree with its little white breast, and its long tail coming after, looks for all the world like a bunch of wool driven before the wind. And, scarcely has the spring sun melted the snow on the first brown spots on the south slope of the hill, than it begins to think about its nest. On the branch of a birch or of a young spruce, it forms in the course of three weeks time a great oval dwelling, quite closed at the top, and only furnished with a hole large enough for the bird itself to slip in, about the thickness of a man finger. This nest is often 6 inches high and 4 wide, but is made so large because it is designed to hold not only the sitting hen, with all her long tail, but by night the cock too, besides all the young ones, which sometimes are as many as 16. Externally it is covered with the finest lichen, strips of birch-bark and moss, and yet in spite of its size, it harmonises so well with its surroundings as to exactly resemble the lichen-grown stump of a bough. And it is as snug and warm within as it is beautiful without, quite filled, often with large feathers, almost always from the Black-cock, which the active birds seek out in the forest hard by. None of our native birds' nests can be compared with that of the Long-tailed Titmouse.

One European bird only does not sit upon it's own egg. The hen Cuckoo, much less the cock, troubles herself neither with the building of a nest, nor the hatching of her eggs, nor the rearing of her young. This business she leaves, as every one knows, to other insect-eating small birds, in Norway generally to the Winchat, the white wagtail and the titlarks, who have this burdensome duty imposed on them. The reason of this strange phenomenon, which goes through the whole cuckoo family, which in the tropics counts not a few species, has been sought in the extraordinarily slow development of the eggs in the cuckoo's ovary, each egg requiring about eight days in order to be ripe enough to be

laid. Now should the hen, which lays in all from four to seven eggs, herself hatch them all, the first-laid would be addled when the last is laid, and she could not possibly hatch them one by one. But this explanation only brings one to the farther question, why are the eggs so slowly developed? This, and more, which we shall point out as opportunity offers, belongs to the many still unexplained facts, which mark the history of the propagation of this bird.

## Chapter 4.—Hatching and Rearing.

Again and again flies the hen to the finished nest, contemplating it within and without to put it to its final proof, and the cock's jubilant song and the hen's quiet joy prove that the work is satisfactory. Again affection begins to stir them, the cock renews his tender attentions till he wins the victory.

Next day the first egg lies in the nest, and the remainder follow, one every day till the number is complete. The larger birds of prey allow one or two days to go between each egg, the cuckoo-hen nearly as many weeks, individual titmice sometimes lay an egg also in the afternoon. The eggs are laid early in the morning, in general between 6 and 8 o'clock. While the egg-laying lasts the birds seldom keep near the nest, but often spend the day at some distance from it. Only a few species begin to sit when the first egg is laid, but they may often sit in the nest for warmth in bad weather.

The time of egg-laying varies from the close of March up to July. The earliest are the owls and ravens, which often have eggs in the last days of March; in the case of the other birds of the crow kind the hatching season is about the middle of April. Next come the titmice, the ernes, the woodpeckers, the herons, and the grouse-kind,* that mostly hatch about the beginning of May. The immigrants are the last, thus the yellow-breasted warbler† and the spotted flycatcher seldom have eggs till June, the quail and the swift often not till even July.

The cross-bills are the only birds which in their nest-building and egg-lying are not bound to any definite time. In general the hen hatches off her young in January and February, in the very middle of the severest winter cold, and therefore constructs a nest of which the lining and the size are intended to withstand it. But yet the cross-bills often hatch in June, and throughout the whole summer, and in this case the nests are small and airy. The cause of this deviation from the usual habits of birds, must be the fact that it is just

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* Viz.: Capercaillie, Blackcock, Hazelhen, Willow-Grouse.

† Sylvia hypolais (Lath).

in winter time that the seed of the Scotch fir, the principal food of these birds, is fully developed, and it is unquestionable that a super-abundance of food not only hastens the laying time of birds, but also makes them more prolific.

Most of the larger birds lay once a year only. But among many of the sparrow family, and swallows, finches, larks, and yellow-hammers, the older individuals sometimes lay two sets the same year, the common sparrows as many as three or four, according to the character of the summer and the abundance of food. If one takes away carefully the eggs from a nest, but leaves, carefully, at least half, the birds readily lay more than their normal number, and some, for instance the wryneck, together with several of the falcons and ducks, seem sometimes to be unwilling to stop till the nest is full. Thus, by taking a reasonable toll, one can have no inconsiderable profit, especially in the case of the species which hatch in colonies on the bird rocks, but also in those which breed singly, as the ducks. If all the eggs are taken away, the nest is deserted, and the birds usually build a new one in a different place; this time the hen generally lays fewer eggs than the first time.

The numbers of the eggs varies very much. As a general rule, which has but few exceptions, we can say that all the species which live on vegetables mixed with animal food, lay the largest number of eggs; next come those which live more exclusively on plant-food, and last of all the birds of prey and most of the sea birds (except the duck family) which live exclusively on animal food. And this difference in fecundity exactly tends to preserve the balance between the species. For if, for example, the birds of prey were more prolific they might well threaten whole families of other animals with destruction, and if the gallinaceous birds did not lay their large number of eggs, they would inevitably meet with the same fate as many birds in New Zealand, and soon become extinct by reason of the persecutions to which they are incessantly exposed from men and animals.

The partridge lays the largest number of eggs, having twenty eggs and even more in its nest. The ducks, except the eider-duck, lay likewise a great number, oftenest twelve to fifteen, our wild wood-grouse have generally eight to twelve. The crakes are also prolific, thus the corn-crake and several with us rare species of the same family lay about ten eggs. Of smaller birds the Wryneck lays from eight to twelve, the long-tailed titmouse as many as sixteen, on the whole the tits are prolific birds, and most of them lay 7 to 10 eggs. The greater number of the sparrow tribe lay on an average five eggs, and nearly all the waders four. The diurnal birds of prey have mostly three eggs, whilst the owls often lay more; three is also the number laid by nearly all gulls and terns. The doves, the swifts, the skua gulls, looms, nightjar,

black guillemot, crane, and individual diurnal birds of prey, have two. The only birds which breed in Scandinavia which have have one egg only are the auk, the guillemot, and the Puffin.

It is a most remarkable fact that the same bird lays a larger number of eggs in the temperate than in the warm zones. This can be shown even in the various latitudes of Europe; thus the average number of many small birds' eggs is higher in Scandinavia than, for instance, in Central Germany.

The size of the eggs has often but little proportion to that of the bird. The black guillemot lays eggs as large as a hen's egg, although it is, itself, the same size as a dove; the common sandpiper lays eggs, larger than a magpie's, a much larger bird. On the other hand a cuckoo's egg is never bigger but often smaller than a sparrow's, and is sometimes laid in the nest of the diminutive wren, whose skin, feathers and all, is but a little bigger than the cuckoo's head.

The shape varies equally, and not seldom differs from the usual so called egg-shape. Thus, in the case of the Swift and Nightjar it is cylindrical and approaches the spherical in individual owls. The eggs of the waders are for the most part unusually large, and are strongly pear-shaped, and are invariably laid in the same position, viz. with the pointed ends all together. The reason of this is obvious, in that in any other position whatever they would take up more room than the sitting hen could cover. But the Guillemot's egg is also strongly pear-shaped, and in this case economy of room is no object, for this bird never lays more than one. This lies without anything under it, on the edge of a rock, and often on a perfectly smooth surface, swept by every wind. The bird must at times leave the nest; but how can the egg now escape falling off? just by its shape. If one lays a full, pear-shaped egg on a table or other smooth surface, and blows upon it, one will find that it incessantly rolls round in a circle, without falling off.

The eggs can bear considerable pressure, especially while they still hold their contents. It is well known that one cannot without difficulty crush a hen's egg held between the thumb and forefinger, and both smaller and larger eggs will sustain a proportionate pressure.

The variation in colour may be said to be endless, even in the eggs of the same bird. Many lay purely white eggs, as all the Owls, Woodpeckers, and Doves, but most eggs are varied with red, yellow, green, brown, and other colours of innumerable shades. The Woodpecker's egg is among the most beautiful of all our birds' eggs. These are snow-white and shining, and when freshly blown are of a blueish clearness, and transparent. The eggs of the Yellow-hammer are marked with a number of dark irregular lines on the reddish ground-colour.

The Cuckoo's egg * varies in the most extraordinary manner, and the most marvellous thing is that it seems in colour always to approach that of the eggs among which they are laid. Thus they are a uniform blueish white when laid in the nests of the Whinchat and Wheatear, but spotted † in the nests of the Tree Pipit. How this can be is still a puzzle, and many are the explanations which have been suggested. The most probable is that the Cuckoo carefully seeks out those nests in which the egg which she has just laid differs least from the eggs already laid in it, but this explanation involves the necessity of acknowledging a sense of colour in the bird.

As soon as the hatching time begins the bodily warmth of the bird rises, and some few feathers either fall out or are plucked out on purpose, by which means the so called "hatching-spots," are developed. These "hatching spots," which permit the radiation of heat from the body, are found under

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* As the subject of cuckoo's eggs has lately attracted some interest, I add some remarks on them taken from Herr Collett's little work on the ornithology of the neighbourhood of Christiania:

"The species of birds in whose nests the cuckoo most commonly lays her eggs in the neighbourhood of Christiania are ANTHUS ARBOREUS, MOTACILLA ALBA, and SAXICOLA RUBETRA. Prof. Rasch speaks of a remarkable example of an egg being laid in the nest of EMBERIZA HORTULANA, a bird which is partly granivorous, but yet during the hatching season mainly insectivorous. They are laid from the very beginning of June on into July; in 1857 I saw a fresh egg in a tree-pipit's nest on the 5th of June.

"Among the many still unexplained phenomena which characterise the history of this bird is the generally accepted fact that the cuckoo's eggs, which vary one from another to a great extent, do in colour, more or less, approach the eggs among which they are laid. This have I found invariably the case; thus in a nest of SAXICOLA OENANTHE, among the blue white eggs, lay a cuckoo's egg, whitish with almost invisible spots, and, size not being taken into consideration, remarkably like them. In the nest of SAX. RUBETRA have I seen cuckoo's eggs blueish green, often without spots, in that of ANTHUS ARBOREUS closely covered with brown spots on the dark ground colour, in that of MOTACILLA ALBA, with small blueish grey spots evenly spread over the whiteish ground colour.

A great help to the explanation of this will be to ascertain whether it is the case that the same cuckoo-hen, which is believed to lay from five to six eggs, always lays such as resemble one another in colour, or whether the eggs from the same hen vary. If the first is the case, Prof. Sundevall's explanation seems to have great weight, viz., that the cuckoo which has been brought up in the nest of a certain species of bird, not only has the property of laying eggs which are like those of that species, but also an instinct to lay eggs in nests of the same species. In the latter case, which is however the least probable, it can be explained in a different and less intricate way. The moment one comes to the knowledge that the hen lays her egg on the ground, and carries it in her bill to the nest which is to receive it, (for in no other way could it be introduced into many wagtail's nests, or into that of the above mentioned wheatear), can one take it for granted that the hen, which cannot be denied the power of distinguishing between colours, searches out among many nests which she has already found, that in which her egg is least unlike the rest."

† This word (plettede) may mean also stained, speckled, blotched.

the belly, and are one or two in number. In general they are peculiar to the hen, but the cock also has them in those cases in which he takes a part in the hatching. In the Phalaropes, whose economy differs from that of most other birds, inasmuch as the whole of the hatching and nurture of the young birds in their case rests exclusively on the cock, while the hen takes no trouble whatever about the matter, the cock alone has these spots. In the Doves and some swimming birds they are wanting entirely.

The duty of hatching lies upon the hen almost entirely, the cock but seldom taking this work of patience on him. But he often procures food for his mate, and contributes in various ways, mostly with his song, but also with his performances in flying, to make the time pass quickly to her. When a cock Titmouse comes near, with food, to his sitting hen, she is aware, even at a distance, of his approach, and she never omits to answer him from within the nest, and even comes to the entrance hole to receive what he has to offer her. But in the case of several birds, the cock assists his mate in the hatching. This is so with the Woodpeckers, Doves, and also several waders and swimming birds, the hen sitting all night, the cock only by day, and always for a shorter time than his mate.

It is a very remarkable fact that in great colonies of birds such as those on the bird-rocks on our northern coasts, the hen seems not seldom to sit on eggs which belong to another bird; thus their hatching is a kind of joint stock business. Faber the naturalist drew from a hole, in which lay one single Puffin's egg, six sitting Puffins one after the other, in one day.

The bird, during the time of sitting, approaches its nest with the very greatest carefulness. She comes flying, without uttering a sound, often from the same quarter, stilly and carefully she slips in, and sits on her eggs. But most, when disturbed, give audible notice of their anxiety, and fly frightened round the nest. Others under these circumstances maintain their caution and quiet, thus the bullfinch, during the sitting season, scarcely ever lets a sound be heard, and for this reason is but seldom seen in our forests during the summer, although they breed on the hill slopes all round us.

But no bird has this last peculiarity in a higher degree the waxwing. Up to within ten or twelve years ago the movements of this bird were a complete mystery, and the most wonderful stories of its summer abode and nest-building were current in the published accounts of its natural history. A persevering Englishman, Mr. Wolley, had the good fortune to lift the veil, having found several nests in the wide desolate forest tracts of Swedish Lapmark, and not always far from the dwellings of men. The reason of their having been able so long to conceal themselves from search is simply the astonishing cunning and carefulness shown by the sitting bird about its nest. That they never let a sound be heard was to be expected, but in general they

left the nest long before any one came near it, and if it was ever taken by surprise, it could be seen how the bird let itself fall to the ground like a stone, and stole away without the least noise, and never came within sight of the nest again for many hours.

Other birds are so phlegmatic that they let their eggs be taken from under them without making any movement in defence. This is the case with some of the guillemots, puffins, and other sea-fowl. Titmice, fly-catchers, and the water ousel often sit so close on their eggs as to let themselves be taken by the hands, and many quails, corncrakes, and partridges are cut in two by the scythe, not having forsaken their nest in time. The eider-ducks, which in the north of Norway and in Iceland are almost domesticated, allow themselves to be stroked on the back, while sitting, without showing any other displeasure at this familiarity but ruffling their feathers and producing a hissing sound, and, when they fly off, they sprinkle the eggs over with their liquid droppings to secure them from being touched.

The mother-love is now days and weeks in attaining its object, and day by day the little germ is developed within the egg. In order that the eggs may be uniformly warmed, they are turned round at least once a day, and they are invariably so placed in the nest as to take up the least possible room. It often happens with birds that lay on the ground, that one or two eggs either by being turned or in some other way roll out of the rest, but these eggs are never brought back by the bird, but are left and spoilt. Such eggs are not seldom found in the case of the partridge, quail, and wood grouse.

The time during which the bird sits varies, but is usually shorter with the smaller and longer with the larger birds. The golden-crested-wren, our smallest bird, hatches off its eggs, which are not much bigger than peas, in twelve days, the hooper hatches off hers in thirty-five. The weather and the situation of the nest have also an influence on them. Thus our tame pigeons sit for seventeen days, while the far smaller quail requires twenty-one and more. If the weather is warm, the young swallows creep out after the expiration of thirteen days, in bad weather the mother is obliged to spend a longer time in seeking for food, so that the eggs are often not hatched till the 17th day.

At last the germ grows into a fully developed chick, and one fine day it hammers with its little beak at the inner wall of the shell in order to come forth into the world. The parents give no help in this, but the little creatures are furnished with a hard scaly knob on the beak which gives them the power of breaking the shell for themselves, and besides this, the shell is itself brittle and cracked as the hatching time is near. With all the sparrows, climbers, doves, and birds of prey, the young come forth from the egg as helpless as a new born babe, and it is not till they are able to fly, which, in

the birds of prey, is not for some four or five weeks, and in the smaller birds for two or three, that they are sufficiently developed to be able to leave the nest and help themselves. Warmth is therefore of greater necessity to them at first than food, and it is not till after several days that the parents go out regularly to search for food for them.

But in all the Gallinaceous birds, and also the waders and most swimming birds, the young are so fully developed at their birth, that they can at once run about in their pie-bald down clothing. They remain no longer in the nest, which generally lies on the ground, and can give them no shelter, than until they are thoroughly dry, on which they are at once led by their mother out into the forest, among the reeds, or in the water. Thus one may often see the young partridges, which have just crept out of the shell, run about with a bit of the egg-shell on their heads.

Some waders and water-birds do not, like the rest, breed on the ground, but either in hollow trees, as do several ducks, or in an old crow's or thrush's nest, as do some of the snipes.* But in these cases how are the little new-born things brought down to the ground, for they do not wait in the nests till they are able to fly? Without further ceremony the hen takes them by the neck, and flies down gently to the nearest water, where she sets them down one after another. And it is often enough the case that the distance, which the little creatures are thus carried through the air, is by no means inconsiderable.

The food, of which the young partake in the beginning of their lives, is often different from that of the old birds. Thus most of the granivorous small birds, as yellowhammers, bullfinches, and finches, feed their tender young on insects; the young of some raptorial birds get half-rotten flesh, and the young doves are fed on a peculiar cheesy substance which is developed in the mother's crop.

The rearing of the young is often difficult enough for little birds, when they, like the tits, have a numerous and ever-hungry progeny. So that both parents have quite as much as they can do to get food for their young, and the number of insects, larvæ, and other "small deer" which a pair of small birds can collect in the course of a day, is quite incredible. How many insects a pair of long-tailed titmice must collect every day to satisfy their fourteen or sixteen young ones, no one has ever had the means of computing, but calculations have often been made as to what sparrows bring home, and this shows a total of several hundred insects a day. The sparrow-hawk brings its young, in their greediest time, twenty small birds; buzzards, kestrels, and owls daily carry home at least as many mice.

* e.g. Totanus, glareola, and ochropus.

One can hardly imagine a prettier sight than a pair of small birds feeding their young. With neck outstretched the little creatures sit in the nest waiting for their parents, and with gaping mouths and piping voices call out for their proper share; and as soon as their whole supply is divided, off they fly again for a fresh one, and begin the feeding over again, never tired, though often themselves contending with hunger.

It is often difficult to understand how, on the whole, the parents are able to procure a sufficient supply of food for all these little ones. But the most incomprehensible thing is how they can divide it equally, especially when the nest lies at the botton of a dark hole in a tree. One often finds, as mentioned before, from ten to sixteen young in a titmouse's nest. The one sits close by the side of another, the one head as like to the other as two drops of water, and not one of the little throats is shut, not one will allow that it is satisfied. The two parents are never at the nest at the same time, and yet each nestling gets exactly its share, never more and never less.

In one case, however, has it been seen that the birds have been unable to come up to the demands made upon them, viz., when a pair have come in for the unhappy fate of having had a present in the shape of a cuckoo's egg. The young cuckoo grows and thrives, its big body wants food, and a great deal of it too, and the unwearied foster parents have to use all their powers to appease its insatiable hunger. They are often worn out by the abstinence they submit to, and are on the point of giving in, when help comes in the shape of a beneficent little bird, often of quite a different genus, which does its best to support them in the burdensome duty which is imposed on them. Thus Prof. Rasch once observed a pair of whinchats assisted by a garden warbler.

With true heroism and a touching contempt for death the parents endeavour to defend their eggs or young from danger. But the weapons which they employ for this purpose are various enough. Birds of prey, plovers, gulls, and terns thrust furiously down at the hunter, and often touch his head with their wing-points, whilst his dogs not seldom feel the sharp claws of the hawks and owls; gallinaceous birds, geese, and other birds are often as bold as these. Most songs birds, as well as certain waders, endeavour to avert danger by dissimulation, flying along the field with piteous cries and hanging wings as if they were wounded, to attract observation away from the nest on to themselves. And this often succeeds with dogs and other animals, but as soon as they are enticed far enough away, the bird suddenly raises its wings and flies swiftly away.

The fieldfares have another means of protection, like that of the eider-ducks, when, as we have described before, they leave their eggs. Only it is aimed directly at one who comes near, and every one who has visited a breeding

colony of these birds, must have experienced the danger of disturbing their domestic life.

As soon as the young are able to fly, a new phase of their life begins. The young citizen of the world must be trained to his calling, he must be taught to move himself about in the world, and his parents must be his teachers. They remain in the nest no longer than till their wings can bear them, but the whole family spend the night sitting close to one another on a bough. Gradually the parents cease to bring them food in their bills, but try to accustom them to get it for themselves. One can often see those birds, whose special forte is flying, give their young formal instruction, and as all young birds are obedient children, they catch every motion of their parents, and thus it is not long before they are just like their parents in one and everything.

For a longer or shorter time the young follow their parents, but by degrees, as they learn to take care of themselves, the family bond is broken. With some, however, the family life lasts longer than this, and these form smaller flocks, which keep together all the rest of the year, often in company with other families of the same species, and they no not separate till the next year. The ravens, swallows, most of the titmice, as well as Gallinaceous birds do this. But most trouble themselves no more about their young when once they are able to fly, but leave each one to maintain itself, some even drive them off by force, as the water-ousel. These, disinherited, must now win themselves a place, where best they can, to spend the rest of the summer. The following spring the families shift, and thus passes away this portion of their lives, with its joys and its sorrows, after the manner we have just described.

## Chapter V.—Migration.

During the winter the songs of the birds are silent in the leafless northern woods. A great number of our winged songsters who seem only created to cheer our northern nature, are not ours entirely, we have them only for a part of their lives. When the autumn wind drives over the stubbles, and trees and bushes begin to change the colour of their leaves in the cold nights, then also is broken the bond which unites the migratory birds to the land of their birth, and they get themselves ready for their long wandering. And before that life in the field and forest is dormant, and the snow spreads its white carpet over slumbering nature, they depart in flocks for the distant south, to exchange the long northern winter nights for life in the warmer zones.

So much for the migratory birds. But all our birds are not migratory. Many stay behind, and spend the winter with us, and even our northern latitudes are the southern winter abode of some species, which pass the

summer in the very highest north. But when the spring sun again revives the germs which lie in the bosom of the earth, and urges them to unfold themselves to a new life, then our summer guests do not keep us long waiting, but come back again, one after the other, in flocks and in companies, with joyful spring sounding in their throats, and with summer after them.

When autumn comes, then begins a peculiar life to stir among the birds. The migrants leave their summer quarters and move southwards, and sundry others, which are at rest during the summer, begin now to rove from tract to tract. The wanderings of these birds, however much they may differ with respect to their cause and object, may be comprised under two heads—migration and roving, and thus all birds belong to one or other of three classes, migratory, roving, and stationary birds.

Migration is a necessity to many birds, that is, an inborn instinct, grounded partly on a want of food and partly on an irresistible desire of migrating; it has a definite direction, and repeats itself at definite times. No migratory bird has to be taught this journey, none needs any guide, it moves southwards of its own unchangeable instinct, which it cannot itself control. As the cold season comes on, the insects and other "small deer," which form the food of whole groups of birds, betake themselves down into their underground winter quarters, and their enemies and persecutors have no other resource than to seek for food in foreign countries. Those that live on different kinds of plant-food share the same fate, and their thin feather covering can by no means shield them any longer against our northern winter cold. And even species which have enough protection against the cold, such as geese, ducks, and sundry others, are shut out at this time from access to their food by the ice which covers the waters.

But that it is not only want of food that drives them away is clear in many cases. Tamed wild ducks and geese have food in abundance in their captivity, but, with the approach of autumn, the longing for migration makes them raise their wings. Young migratory birds taken from their nests and kept in cages prove the same thing. They know nothing of the severity of winter, they have no experience of the distant south with its mild skies, and yet when autumn comes and the migration passes over them, they sit uneasy in their cages, flutter round anxiously, and let their decoy notes be heard incessantly; they too would fain migrate with their mates, but become quiet again as soon as the time for migration is over.

And, besides, birds often depart before they can be aware of any want of food, and before they have yet felt any cold. The quail and the double snipe are so fat that their skin bursts when they fall on hard ground, the cuckoo, the shrike, the osprey, and the short-eared owl, are also enveloped in a coating of fat, nearly all of them are in their best condition, and yet they go. Migra-

tion is a mysterious phase in the bird's life history, and always will be, and it is easier for us to fathom the laws for the wanderings of the planets than of the little beings which are found all round us.

The diminution in daylight seems also to have something to do with migration. Thus at the beginning of August the cuckoo has food and to spare, for the hairy caterpillars, which form a substantial part of their diet, are found at this very time in the greatest numbers, the dog-days are in and provide for warmth, and yet they go. But the increasing length of the nights, for which man does not care, causes an uneasy feelings in most birds, the children of light. By night various dangers threaten them, which they can avoid by day and the inactivity of the long nights is uncongenial to their lively nature. Therefore the birds sing for joy when the sun rises, therefore from the top of a tree or some other high-raised place, as long as they can, they enjoy its light, when it is on the point of disappearing.

A connecting link between the migratory and the roving birds is formed by those species which pass the summer either in the arctic regions of our part of the earth, or on high fells, but which in winter seek for shelter in our southern lowlands. They often extend their progress still farther south, and show themselves in middle or southern Europe, and that they come very near to the migrants is seen in the fact that, like them, they are entirely absent from their breeding grounds in winter, which roving birds ought not to do. Such are the waxwing, the hawfinch, the snow-bunting, and the redpole, which all, in larger or smaller numbers, make for the southern and western parts of Norway in winter, and the same is the case with some of the high-northern swimming birds, which winter by the side of the ice in the south.

The movements of the roving birds are neither made at any fixed season, nor in any fixed direction, but it is in general the case that they depend on the nearest supply of food. Extreme cases of this kind of wandering are a sort of incomplete migration, in that a species suddenly abounds in districts in which they were before either entirely wanting, or only found in inconsiderable numbers, and by degrees disappear again. A remarkable example of the first, and one of the most extraordinary phenomena in ornithology in our times, was the emigration which a little Isabella-coloured* and most peculiar gallinaceous bird, the sand-grouse,† took to Europe in 1863. Its home is in the endless wilderness and steppes which extend in middle Asia quite up to the borders of China, but for some, to us, inexplicable reason in that year it spread over all Europe in considerable numbers, and showed itself in almost every country, even in our cold Norway. Thus in the course of August about a

* See note to The Complete Angler (Walton and Cotton), Part ii, Chap. 7.

† Syrrhaptes paradoxus.

dozen specimens were shot, and many more seen in different parts of the country, as far as Bergen, and stuffed specimens are set up in the museums of Christiania and Bergen. They arrived so early in Denmark that they rested on the heaths in Jutland, and even bred in their new home. The next year not one was seen in Europe, their disappearance was as great a riddle as their arrival.

As examples of the other case, viz., of a species suddenly spreading over a district in which usually only a few can be found, we may mention the rook, the nutcracker, and the crossbills. The two former are of our rarer birds, but in some years have appeared in innumerable flocks over the whole of the south of Norway, and have bred in great numbers; gradually their number has decreased, and in the course of a few years they have disappeared. The cause of this movement, which has a great resemblance to the well known march of the lemmings* to the lowlands, must, as in their case, also be sought for in a sudden over-peopling of their native soil. The crossbills are more gipsyish in their appearance, and their wanderings are more easy to explain, seeing that they are caused exclusively by want of food. The fact is that these birds are so entirely dependent on their main food, the seed of the spruce-fir, that they follow its developement from one tract to another, and if they are found one year in numbers in any place, one may be sure that there has been a sufficient crop of spruce seed, but should the crop afterwards fail, the birds vanish entirely. Thus in 1863 the common crossbills were found in astonishing numbers in the whole valley in which Christiania lies, and bred in great numbers in all the hill-slopes round. But in the autumn of that year there was a thorough failure of spruce-fir seed, and the cross-bills vanished to a bird. The year after they had advanced to Österdal, where the flock remained till the summer of 1866. They then flitted again, and settled in great numbers in Örkedal, and in the Drontheim country, where they still remained in the summer of 1868.

True roving birds are, on the contrary, the woodpeckers, titmice, and most of the crow family; these have no especial object in their wandering, and food is often as good in one place as in another. The siskin seems to be more dependent on its food, and has, on the whole a good deal in common with the crossbills. Woodgrouse are more stationary, and only shift in autumn and winter within narrower limits in the forests; but suddenly and almost accidentally their movements become distant wanderings. Thus it has happened that blackcock and capercaillie in certain years, all at once, and apparently without reason, have left the tract in which they were born and

* Lemmus Norvegicus; a small species of rat, about 5 inches long, seen in some years in immense numbers on the Norwegian and Swedish fells.

have lived all their lives, and gone to another, but, unable to find their way back again, have been obliged to remain, and have been surprised by spring; the hens lay and hatch their eggs under a bush, and the summer passes away; but in autumn the desire of wandering again seizes them and they disappear, leaving no traces of themselves.

We here propose to consider the migratory birds more especially. The largest part of our birds, which in all number about 250 species, are migrants, and only an inconsiderable number are stationary. They cannot be classified, yet we may say that nearly all waders are migratory, all gallinaceous birds, except the quail, stationary.

Every species has a fixed time for its departure and arrival, which under ordinary circumstances varies only a few days. But many circumstances can influence it. First it must be remembered that the advance of the year with us in the north has little or no influence on their arrival, but has a good deal on their departure, which always depends on the state of the weather at the place from which they go. The spring of 1867 was more than usually severe all over Europe, and heavy snow-storms occurred as late as May, less severe far north than in middle Europe, but this was something quite beyond the calculation of the migratory birds. They came at their regular time, but perished by hundreds of hunger and cold, especially in Denmark and Germany. The spring of 1868 was unusually mild and early, the snow had disappeared from our southern lowlands as early as March; but the greater part of the migratory birds did not make their appearance that year till after the usual time.

We shall now in a few words point out the order in which our best known migratory birds come and go. As a rule it is the case that the species which are the last to go in autumn are the first to come back in spring, and *vice versâ*. But this does not seem to depend on the longer or shorter distance which the different migrants perform, and some, which disappear early in autumn, may spend the winter in southern Europe, while others which remain here longer, betake themselves as far as the tropical parts of Africa.

With the first southerly winds, which sweep over the snow-covered fields and frozen lakes of Scandinavia, come a lark or two as harbingers of the still distant spring. Even in the end of January can sometimes be seen this our earliest migrant seeking its miserable food on the roads along with its friends the yellow hammers; more come in the course of February, but it is not till the beginning of March that they begin to show themselves in larger numbers, and by the close of the month their songs resound over all the fields, which now begin to be brown.

About the middle of March the jackdaws pass over us in flocks, and let their peculiar short cry of "yak, yak" be heard. In the end of the month

come single blackbirds, linnets, chaffinches, and greenfinches, and peewits and oyster-catchers to the west coast.

In the beginning of April the thrush-like strophes of the redbreast are heard from our gardens and groves, the starlings revisit their breeding boxes* of the year before, and salute their birth-place with their queer hurdy-gurdy-like notes; the kestrel begins its attacks on the small birds, which however take very little notice of it; in the still leafless groves the redwing raises her loud song, with which a flock of bramblings combine their piercing love-notes; the missel-thrush with its abrupt melodious notes welcomes the spring, and the hedge accentor insinuates itself silently among the bushes and thickets. In the edges of the woods sit the proud ringdoves, making their excursions to the fallows, and soon all the hill-sides re-echo in the clear spring evenings with the full choir of the song-thrushes, with which a migrating woodcock mingles his short sharp love-note which never fails to electrify the sportsman who hears it. Soon the well-known twitter of the wagtail resounds from every roof, and now come the hen chaffinches, who are received with joyful song by the expectant cocks.

In the middle of April there is a short pause in the arrival of the migrants. Different species of duck, which have wintered by the edge of the ice, now show themselves along the shore, the ring-ousel jerks its tail from the thickest copse, and the wheatear from its stone, the stock-dove coos, and from the top of a spruce-fir the chiff-chaff repeats incessantly its song of "chip chap," "chip chap," to all who will listen.

In the close of April the black-headed buntings flock into the copse woods, the meadow pipit utters its whistling "st, st," in its peculiar hopping kind of flight, and high over our heads resounds the shrill scream of the looms while they fly in pairs up to their fishing lakes in the mountain forests. The close flocks of chaffinches are kept in constant alarm by the hovering hobby and merlin, the buzzard sends its melancholy cry down from the height, the golden plovers, the curlews and other waders show themselves in flocks on our fields and coasts. Great flocks of grey geese migrate every day over our heads, and in the last days of the month comes the cock redstart, who at once and unceasingly lets his clear notes be heard from our groves and gardens.

Most of our migrants come in the first half of May. Then the wryneck first lets us hear his uniform pipe, and the trill of the tree pipit, the modest songs of the whinchat and the ortolan resound on the fields, wherever one turns. The black and white flycatcher has already taken possession of his last year's hole, and sits patiently at the entrance waiting for his mate, who

* It is a common practice in some parts of the north of Europe to set up breeding boxes on and near the houses for starlings and other birds to breed in.

does not come till some days later. Various songsters are already singing with their full throats, and the earliest swallows fly over the fields.

First, in the middle of May, when the trees are in the act of springing into leaf, the cuckoo is heard, and sings unweariedly in forest and grove her well known notes: the swifts hunt, whistling in the warm spring air. The yellow wagtails and the sandpipers let themselves be heard, while the spotted flycatcher moves, silent and still, as always, among the boughs. The garden warbler and the lesser whitethroat unite with the other warblers, and the sociable sand martins resort to their breeding places in the steep sandhills. Unweariedly the corncrake utters his crake all night long and much of the day to boot, and on the open hill sides the nightjar is actively engaged in his pursuit of the swarming moths.

There are not many now left behind. In the latter end of May comes the red-backed shrike, which sets about nest building the very day after its arrival, the yellow breasted warbler * and the quail. This last is spreading more and more over the country and their easily distinguishable notes are heard in most of our lowland clover meadows.

In autumn the birds depart in nearly but not quite the contrary order. Even as early as the end of July or the beginning of August the old cuckoos leave us, while the young remain on till September. Some fine evening in August the swifts break up, as do the yellow breasted warbler, the quail and the red-backed shrike. In the first half of September several warblers, and also the lesser and the greater whitethroat, besides the ortolan, wryneck, yellow wagtail, sand martin and nightjar, the terns and some of the snipes. About the middle of September depart the swallows, the redstart, flycatchers, wheat-ear and whinchat, the cornerake, tree-pipit, golden plover, curlews and others. In the end of September we see the last garden warblers, and willow wrens, the small falconidæ and other birds of prey depart, and the flocks of grey geese are often seen flying to the southward. In the beginning of October go the white wagtail, the meadow pipit and the doves: in the middle of the same month some of the hardy warblers, as the chiff-chaff, blackcap, redbreast hedge accentor, and now at last disappear the linnets, the hen chaffinches, starlings, woodcocks, blackheaded bunting, looms, and most of the larks: and at the close of October we say farewell to our latest migrants, viz. the thrushes, cock chaffinches, the brambling, the jackdaws and the last larks. Even up to the first days of November can one see an odd wagtail or two, a blackbird, woodcock or ringdove, besides jackdaws and single finches which even spend the winter with us, but these are stragglers, and almost always look sickly or crippled.

It is a very rare thing for any of the regular migrants to winter in the east part of Norway. But on the west coast every now and then one comes

* Not British.

across wagtails, redbreasts, blackbirds, redwings, woodcocks, starlings, and various ducks.

But after the migrants leave us in autumn, those of our stationary birds that pass the summer in the forests come near to the inhabited places, the roving birds make their appearance, and contribute with our constant residents to prevent our groves and gardens appearing quite lifeless. The titmice come forth from the forests in flocks, and constantly have in their company tree creepers, golden crested wrens, common wrens, and nuthatches. The nut-crackers, which in summer are almost unseen, hover silently near the houses, the woodpeckers visit our gardens, and the bullfinch searches the mountain ashes by the road sides. The goshawk, and its smaller but more active cousin the sparrow hawk reappear after their hidden robber-life during the summer in the forests, and the water ousel ducks and wades, swims and runs by the edges of our rivers and open running waters. The capercaillie and blackcock begin also to bestir themselves, and often fly to the adjacent birch copses to reach the dainty birch catkins; the willow grouse come down from the high mountains, but not so far down as to the bottom of the valleys, and the rare partridge seeks a refuge from the snow and cold by the barns, where however it but seldom enjoys the hospitality it seeks, but is pretty sure to fall a sacrifice to men or animals.

And last of all come those of our high northern species which look upon our lowlands as their south, and take up their winter quarters with us just like true migrants. The high Fjeld sends us the twittering snow bunting, and the countless swarms of the lesser redpole, which like flakes of snow descend upon our fields; one single shrike (*lanius excubitor*), a bird indispensable to the ancient falcon catchers, looks out from the top of a tree, and takes by surprise an unfortunate titmouse, which lays down its life in the claws of this bold pseudo falcon. And, if the year is favourable, the waxwings and hawfinches come down from their northern summer home, enliven the bare trees with their brilliant colours, and are caught in numbers in our snares baited with the enticing berries of the mountain ash.

It remains to speak of the different ways in which the birds travel. All roving birds, and such as only move short distances at a time, move only by day, but the true migrants move by night as often as by day, some for nearly the whole twenty four hours. Some wander singly, some in pairs, some again in large companies, some migrate each sex by itself, as the flycatchers, the chaffinches and many warblers, the cocks departing later in autumn, and returning earlier in spring, than the hens. And it is probable that this is the case with many more species than we at present know.

Every one has seen how the swallows before their departure collect in flocks of many hundred individuals, which rest on the cornices of high buildings,

telegraph wires, or among the bullrushes and reeds of fresh water lakes ; one fine evening they all break up at a given signal, fly for a time round and round upwards to gain a height, and thereupon vanish in the distance. The starlings in the same way collect, before their departure, in flocks which particularly on our West coasts must attain an incredible size. These birds also have the strange custom, as soon as the young can fly, of leaving their breeding place and spending the rest of the summer in company with crows or other birds near the sea, and again collecting towards the time of their departure. This sudden disappearance in the middle of summer is especially observable in the eastern parts of the country, at a distance from the sea, and in the whole of the diocese of Hamar* it is quite difficult to find a starling after St. John's Day.

In the case of some birds, particularly wild geese, cranes, and sometimes wild ducks, individuals take up, as they migrate, a fixed position as regards the rest, flying in an acute angle, open behind. But what is the reason of this? It is not easy to decide, and the explanation usually given, namely, that the flock can in the form of a wedge more easily cut through the air does not seem to deserve to be entertained. It is scarcely probable that the cleaving of the air column can be continued along the whole range from the very point of the angle to the individual bird which forms the last joint in the side of the angle. The distance between each goose as it flies is at the very least four feet. It is more probable that the great caution of these birds suggests to them during their flight to take the formation in which, as far as possible, without getting in one another's way, they can see all around them.

But the form of this angle changes incessantly during their flight. Now some change places, one going out, while the other takes its place, now the whole line wavers, now the angle is more acute, now more obtuse, some times the apex disappears entirely, and the formation becomes nearly that of a straight line. Now a little division leaves the main line, and forms a smaller "Annex," but always angular, between the lines of the larger. Sometimes the whole flock come to a halt in the air, yet without coming down, and fly one round the other with quick strokes of the wings, but soon they begin to fall in again, by degrees each one takes its former place, and the whole flock again continues its march.

The proceedings of the jackdaws during their migration are very peculiar. For the most part they fly high up and straight forward, but suddenly one, with closed wings, falls to the ground, the rest follow one after the other, and in less than a minute the whole company has come down to hardly an hundred feet above the earth. Then by degrees they rise again, attain their

* East of the Great Mjosen lake, North of Christiania.

former height, and begin the old game over again. The same flying performmances may sometimes be seen in the common crow.*

The smaller species of the birds which migrate in flocks, as the swallows, fly in no particular order, but yet in more or less compact bodies. Every now and then they approach the earth and catch an insect or two, but it is only when the weather is decidedly bad that they rest during their journey.

Besides the regular nocturnal birds, and especially the owls and the nightjar, all the bad fliers migrate by night. Such are the ortolan, the blackheaded bunting, the quail, the moorhen, and corncrake, snipes, and ducks, some thrushes, and a large number of the warblers. Often can one hear their love notes through the darkness from above, and so ascertain the species. Thus the greenshank and sanderling usually let their cry be heard in the dark September nights. They mostly spend the day in seeking food, and the sleep they allow themselves during their journey seems to be inconsiderable.

All the stronger species, which are exposed to persecution, as well as all the good fliers, migrate only by day, or, as the larks, during the whole twenty-four hours. These rest by night, and also during the hours immediately after noon.

Bad weather often postpones the migration for a time, and then they are obliged to beguile their time as best they can during their detention. But contrary winds are not to birds what they are to us, for they rather assist than hinder their flight. If they have the wind aft they move irregularly, and are often blown out of their course, but if the wind is ahead their feathers are closed against their bodies and the bird can better pierce the air. Bright days and light calm nights are the best for them, but if they encounter a fog they often lose their course entirely, and go astray to places in which they have no home. The Fauna of every country can show many such individuals.

Some migrants do not reach their goal exclusively by the help of their wings. Many of our ducks swim long distances down the rivers of central Europe, and the heavily flying quails and corncrakes perform no inconsiderable distances running. One has constantly come across such wandering quails and corncrakes, but how are such birds, who fly as badly as any of our home birds, capable of crossing the wide Mediterranean, and of pressing far down into the Tropics? In the course of a journey to Egypt in 1849, Prof. Esmark observed a flock of quails lying and resting on the water in the middle of the Mediterranean. No bird, dead or alive, sinks, and none need, like quadrupeds, to make any movement with their feet or wings to enable them to float. The air-filled bone-system and large lungs of birds are enough for this, and it is probable that some others of the bad fliers have recourse in their weariness to an element which is nevertheless unnatural to them.

* I suppose the hooded crow, which is very common. I never saw our common carrion crow in Norway.

The birds go away silently and as it were with sorrow, and their parting is quiet and unmarked; with joy and song they come back, and lose no time in making themselves known to all and every one. Their desire to return is so violent as often to carry them far beyond the boundaries of their proper home. Thus in spring we are regularly visited by species belonging to southern and central Europe, which however seldom stay with us, but disappear as fast as they came. Thus the stork is a regular spring visitant to the south-eastern parts of Norway, and has been known to go as far as to Bergen and Christiania, in flocks of as many as twenty and more. But our country is not the stork's home, and even if a few individuals have survived the murderous reception that awaits them everywhere from thoughtless men, who shoot at every one that shows itself, they have never been able to remain with us, and have not bred. Many can be mentioned of such far-straying species, we will mention only the hawfinch, the kingfisher, the roller, the ibis, the avocet, the black stork, the spoonbill, and the pochard.

Individuals may sometimes show themselves in quite a different part of the world to that to which the species belongs. This may be accounted for partly by storms, fogs, or other natural phenomena. Thus we are acquainted with a not inconsiderable number of North American species, the well-known passenger pigeon for instance, which have been shot in Western Europe. But for other cases there is no accounting; an occurrence of this kind can we also mention from our own land. In April, 1834, a species of albatross *(Diomedea culminata)* that does not ever show itself north of the Equator, was killed upon the ice at Fiskumvand in Ekor *; this specimen is to be found set up in the museum of the University, in the collection of Norwegian birds.

All migrants seem to hasten their movements more in spring than in autumn, and it seems as if they longed to see the place again in which their cradle stood. And that at least a large number return every year not only to the same district, but to the very same place which they lived in the year before and in former years, we have innumerable proofs. In our own country the observations on this point, like many others, are still few in number; the last which has come to the knowledge of the author of these lines shall be mentioned. Of our common wagtail there is a variety with a coal-black back, which is common in England, but has been observed only exceptionally with us. In the summer of 1867 one of these black-backed wagtails (its scientific name is *Motacilla Yarrellii*) dwelt here at Christiania at the place called Meyerlokke; last year (1868) it appeared again at the same place, remained the whole summer, and will hardly miss coming next year, if it lives.

This is easy enough to observe in the case of swallows, starlings, and others, which use the same nest year after year. The very day after the house

* On the (now alas! ruined) Namsen, 150 English miles north of Drontheim.

martins' arrival they take their old nests into possession, fly in and out, and look for all the world as if they had never gone away. But what puts the question beyond all doubt are the many observations which have been made (*e.g.* in Sweden) in the case of the birds which have been for a time kept in captivity, and then set free again, such as wild geese. These have in many instances year after year faithfully returned to the place where they have been brought up, have recognized the people who were about them, have gone straight to their old feeding trough, and have remained all the summer through; but when autumn comes, they listen to the call from the south, to come back again the next year.

But how this is is to us inexplicable. It is one mystery added to the many others which mark the active life of birds, and one which will scarcely ever be explained. Hitherto all we know is, that it is so.

## Chapter VI.—Life in the South.

Where do our migratory birds pass the winter? They leave us for the south, and come back again from the south. But how far their migration goes is what we know with certainty only concerning a few species. Many lose themselves in the misty distance, without any one's knowing where they stop. This is the case with the swallows, which are known by every child as they fly, free from care, about our fields and houses, and which seem to us so homeish that it must follow as a matter of course that we know their lives from first to last. There is something so mysterious in the disappearance of the swallows as to make it intelligible that the belief ever existed that they spent the winter torpid at the bottom of the sea among reeds and rushes, although this was flatly contradicted by the whole of their organization. That swallows migrated to Africa has long been known, but then Africa is twice as long as Europe. The same is true of the cuckoo and many warblers.

Many migrants go to no great distance, but the winter abode of others includes a great extent of country. In the European coasts of the Mediterranean a great many of our predacious birds spend the winter, *e.g.*, the buzzards, the osprey, the peregrine, the hobby, and also the chaffinches, the linnet, ortolan, and redbreast, all our migratory thrushes, the starling, the hedge sparrow, the doves, a wagtail or two, the golden plovers and others of the

same family, the woodcock and other scolopacidæ, various other waders, and the greater part of our migratory ducks.

Besides a large number of those already mentioned the following birds winter in North Africa:—the merlin, many swifts, one or two of the fly-catchers, the pied and yellow wagtail, the blue-throated warbler (our mountain nightingale), the redstart, the wheatear, the willow warbler, the turtle dove, a great many of the waders, and some of the swimming birds.

The following birds press down quite into the tropics, possibly beyond the Equator:—the kestrel, the nightjar, all the swallows, the cuckoo, the two fly-catchers, the tree pipit, the shrike, a number of wagtails and wheatears, the lesser whitethroat, the yellow-breasted warbler, the quail, the crane, the land-rail, and sundry other more accidental visitors.

Every migratory bird has the advantage over men of being able at once to find themselves "all right" in the place to which they wander, and of finding themselves at home everywhere. The cuckoo searches for hairy caterpillars with the same eagerness among the mimosa groves of the hot interior of Africa, as in our northern forests; the black swift sweeps indifferently the eternal pyramids of Egypt and our homely Church-roofs; the omnipresent wheatear devours with the same satisfaction the tropical insects which it discovers on the relics of antiquity which lie scattered on the Libyan desert, and the scanty supplies of flies and gnats which it catches on our high Fjeld upon the stones which stand out above the stunted willows on the edge of the perpetual snow; the peregrine rests his weary wings with as complete security on the palm-tops of the oases as on the outskirts of our spruce forests; and the wild-duck ploughs the waves of the Nile with the same dignity as the still forest lakes at home.

They all make at once for the place which corresponds to their dwelling-place with us. The predacious birds descend upon the forests, the swallows push on to opener places, the cuckoo, the flycatchers, and the shrike keep to the copses or the primitive forest, the larks and tree pipits run about the fields, the meadow pipits find out swampy meadows, the yellow wagtails the mountain becks, the pied wagtails the inhabited places; the warblers, thrushes, and doves spread about the copses and forests, the starlings fall upon the cultivated land, the cranes by the river sides, and the waders and swimmers in the marshes and lakes.

Egypt is the migrants promised land, and in fact here most of our northern birds of passage are found collected. Here all varities of country are concentrated, lofty hills which gradually pass into flowery, wooded, or inhabited plains, smiling meadows alternating with the burning sandy desert and the most luxuriant primitive forest, the mighty Nile, with its innumerable canals, the coasts of the Mediterranean, and the Delta with its lakes and

marshes. And the number of birds which build and live in Egypt are nothing in comparison to the countless swarms which come in autumn to pass the winter; the number of these according to travellers, borders on the incredible, and it almost seems as if this was the rendezvous of all the birds in the world.

As soon as the cuckoo and the swift have brought the first message of Autumn from the north, the country soon begins to be filled. One after the other the winged winter guests crowd in, singly, in pairs, in flocks large enough to darken the sun. The lakes are literally covered with water fowl in masses two miles across, in forest and thicket living creatures swarm in every bush, by the edges of the waters the waders stand in ranks miles in length, and every sandbank, every island is covered with sea fowl in hundreds and thousands.

This common life lasts the whole winter. But the spring sun gradually disperses the flocks, and some begin to get ready for a move at the very beginning of February; in March those species arrive which have wintered in latitudes still farther south, and in the beginning of April the last of the northern guests have vanished.

The south of Europe cannot indeed offer such favourable places of resort for the travelling bird-world as Egypt, but a by no means inconsiderable number of our northern migrants are collected here, and winter on the slopes of the mountainous parts of Spain and of Italy which are free from snow.

On these slopes, clothed with an evergreen belt of oak, elm, and chesnut, alternating with the thickest brushwood, with waters and rivers, thousands of our commonest migrants winter. Our common redbreast is here so numerous in winter as to be found in nearly every bush; chaffinches and thrushes, especially blackbirds and ring ouzels, crowd into the forests, golden plovers, peewits, and other waders betake themselves to rest by the rivers and marshes. But how are they welcomed here, these migrants of ours, which are found here only as guests, in search of shelter from winter, intending, as soon as the sun permits, to make their way back again to their true home. In the most cruel and shameful manner are they all persecuted, great and small. Millions of harmless swallows, warblers, and other small birds lose their lives for the sake of the morsel of flesh that is found on their tiny little bodies, or else have to spend the rest of their lives in captivity. Behind every tree lurks the fowler, in every bush is found a snare, on every field a limed twig. Labourers and artizans, citizens of good condition, and worldly priests, leave their work and turn out to catch small birds, and thousands of able bodied men are occupied the whole year round in this degrading way. This murder is carried on in Switzerland and Italy to its greatest extent, but Spain and Greece are not very much better.

Thus they encounter no little danger in their migration. The moment they have crossed the Alps and have come down upon the smiling land of Italy destruction lurks for them behind every bush, and if they succeed in escaping this also, thousands of them, wearied, are swallowed up in the Mediterranean.

The bird has at last reached its distant goal, and apparently begins its new life without care. But it is not its true life. It can never repress its longing after home, and during the whole of its expatriation it is deprived of the real happiness of life. Therefore they are all silent, none lets its voice be heard as when at home. Nearly all the species crowd together, even those that at other times live separate, as if they sought comfort in one another's society. Many of them are moulting, and this, which always gives birds a sickly appearance, does not tend to enliven their spirits.

Not a single migrant breeds a second time in its winter quarters, not one builds a nest. They all impatiently wait for their journey home, and when the time for this is near, their spirits rise again, a new life flows through them, and they begin to sing. And so one fine spring morning they again tread upon the spot where they first saw the light, and where their first song was heard, all of them clothed in their holiday dress, all jubilant with happiness and full of confidence for the future.

And when they come thus, larks and starlings, wagtails and swallows, cuckoos and all the rest of them, who is there, whether young or old, rich or poor, who does not feel the spring stirring in his heart, and a sense of happiness and thankfulness at his capacity for enjoying all the goodness and beauty of nature? Therefore spare these children of nature that so trustfully settle among us to gladden us with their song and to draw us to them with their innocence, spare them, not only because they can be of service to us, but because they, like ourselves, fill a place in Creation which men may not disturb wantonly nor without reason. Invite them to dwell among us, give them secure homes in which to lay and hatch their eggs, protect them from all disturbance from both men and animals, and let them find the quiet and security which they seek among us. And to all, especially the young, who, either from thoughtlessness, or an unprofitable love of collecting, search for and take the nests and their eggs, to all these is addressed the earnest and sincere prayer

SPARE THE LITTLE BIRDS AND THEIR EGGS.

## MEETING HELD MAY 20TH, 1870.

THE following donations were announced, and thanks ordered to be given to the Donors:

A collection of fossils from the Isle of Wight, by F. Storr, Esq.,
Echinus from Maestricht, by C. R. Carr, Esq.
Scaup Duck, shot at Mildenhall, by Rev. C. Soames.
Snipe (*Scolopax gallinago*), by J. H. Garland.
Indian Basket and Shells, by F. D. How.
Mosquito Brush, by H. S. Sankey.
Journal of the Linnæan Society, and Miller's "Footprints of the Creator," by F. E. Hulme, Esq., F.L.S.
The "Terraces of Norway," by A. S. Marshall-Hall.
The Heads of Sections gave their Reports.
C. A. Sladen exhibited a series of varieties of birds' eggs.
The Rev. J. Sowerby read the following paper on

## THE DISCOVERY OF CRYSTALS IN THE ALPS.

THE name crystal is applied by the learned to all mineral substances which assume a regular shape, whether they are opaque or transparent. The popular idea would, probably, only admit the name to be properly applied to the latter. I should think that, in some way or other, every one was familiar with the appearance of crystals as popularly understood, and whether we regard their symmetry of form, their beauty of colour, or transparency, we must admit that they are among the most admirable productions of nature. There are certain general forms to which all cystals may be referred; to name or describe these is at present needless, and would, perhaps, be unintelligible; they may be seen in the Museum by any one who cares to look: but, besides, there are very many varieties of these forms; the number of new minerals which have been discovered of late years is very great, and every one of these has its peculiar form and colour of crystal so definite that the skilled mineralogist will at once, upon examination of the crystal, pronounce to what mineral it belonged. Some examples of these are as follows:—The crystals of iron pyrites and of fluor spar are both cubes, i.e., they are like dice, the former opaque, the latter transparent; quartz, or rock crystal, and common ice, have their crystals in the form of a six-sided prism, often terminated by a pyramid; the crystals of carbonate of lime very much resemble the head of a nail, and those of calcite resemble quartz, except that the point is much sharper; the angles at which the planes meet forming an essential distinction. The mode of formation of these crystals is, to a great extent, a matter of conjecture.

There is little doubt that many, if not all, of the crystals found amongst the igneous rocks, must have been formed when these rocks were cooling down from a state of fusion: but, as crystals occur in many formations which have never been subject to heat, they must have been deposited in cavities when the fluid which filled them disappeared by gentle evaporation or otherwise, and again it seems certain that crystallization takes place even in solid substances. Actual observation of these processes in nature is of course impossible, or almost so: geologists and chemists have been led to these general conclusions partly by observation, but chiefly by experiments on the fusion or solution of substances, and their subsequent restoration to the crystalline state. Many substances can be dissolved in warm water, and crystals are deposited as the solution cools: the same may be done with cold water, but the process is slower, and less complete, as the substance is less completely dissolved. In the case of a fused metal, the exterior portion hardens first; after a short time this crust is broken through, and the remaining liquid poured off, when a network of crystals is obtained on the interior of the cavity; or the substance may be vaporized, and crystals are deposited on condensation. The process of crystallization in solid bodies is less readily illustrated. I believe it is a well-known fact that the metal in large masses of iron, as railway axles, has a tendency to crystallise, which has sometimes produced dangerous accidents. The only other instance I know is as follows: large masses of pounded flint and lime are mixed carefully together for the manufacture of porcelain; it has been found that if the mixed mass be left unused for a considerable time, that the particles of flint shewed a tendency to agglomerate and form nodules; exemplifying the way in which ironstone has gathered together in the clay, or possibly, even the flints in the chalk. Quartz, or rock crystal as it is called, if not the most common of all, is perhaps most frequently met with. It is one of the many forms which siliceous earth assumes, and wherever this is present quartz crystals will also be found. Thus they appear in the flints in the chalk, though of small size, and even in the cavities of the chalk itself. I have seen portions of the cliff at Lulworth Cove larger than my outspread hand, covered with small crystals, from the size of a pea to a pin's head. They are, however, much larger in the older rocks; and in mountain districts, either in this country or elsewhere. In the Alps, particularly, they occur of great size and beauty, and it is of their occurrence there that I must now speak more particularly. I suppose there is hardly any tourist, in Switzerland, that has not found the pleasure of his visit enhanced by the finding of crystals. On the moraine of the glacier, on the long slope of shiver on the mountain side, with what pleasure have we greeted the glitter that betrayed their presence, broken though they were, and defaced by frequent pressure against rock or ice. How depressed have we felt after a fruitless search for them, when others returned

with their pockets filled with the pretty six-sided prisms. Fewer, again, are those who have seen them almost *in situ*: who, on some high arete, have found the glittering fragments strewn in profusion, just released from their birthplace by the last winter's frost, with points and surfaces smooth and uninjured. When I was with Mr. Adams on the Bristenstock, in 1863, at a point on the arete, about 9,000 feet above the sea, we found a space of several square yards, covered with pieces, though not of large size. There were 50 or 60 about the size of my fist. After gloating over them, we selected 10 or 12 of the best and carried them down to Amsteg in triumph. The next year, in the ascent of the Ritzlihorn, in the Urbach Thal, about an hour from the top, we were attracted by a crack in the rocks, running in the direction of the strata. On closer examination a dull green light seemed to illuminate the inside, and the word 'Crystal Hole' was muttered by the guide. We wasted half-an-hour at the spot, in vain attempts, which only resulted in a few fragments, and the breaking of an old friend, my alpenstock. The guide no doubt marked the spot, and returned there provided with better means to make his way in.

The patient crystal-hunter whom we meet occasionally, often a bent old man with a pick over his shoulder, may seldom have had a find worth more than a few shillings: the bright spot in his life may probably be that day, so memorable to him, when he got 50 lbs. weight out of one hole, and realized 150 francs (£6) for them. But he has a dream which is ever urging him on to fresh exertions, a dream of the many great grottos in the bowels of the mountains, of which so few are found; he may be lucky enough to find one of them, and then be a made man for life. The great discoveries of which there is any historical record, are very few in number. They seem to be confined chiefly to the central mass of the St. Gotthard, and the branches diverging from it. In 1719, a peasant, of Guttannen, named Geissholz, found a grotto in the Zinkenstock, by the Lauteraar glacier. The entrance was 3 feet in diameter, the dimensions of the interior, 120 feet long and 18 wide; out of this an enormous quantity of crystals was taken. Geissholz at first kept the knowledge of it a secret, and accumulated money by the sale of many large pieces, and was accused of sorcery by those who envied his fortune. The total weight of crystals was estimated at 100,000 lbs., the value 30,000 florins (£3,000). Many pieces were over 100 lbs.; several between 4 and 5 cwt., and one reached 8 cwt. These particulars are given by Dr. Kappeler, of Luzern, who visited and examined the spot. His account differs, in several points, from that of Scheuchzer, who writes, in a letter to Sloane, that the weight of some was 1½ cwt., the value from 4 florins to 1½ Louis d'or per lb. The largest and dearest was 2 feet 9 inches long, 3 feet 7½ inches in circumference, and weighing 2½ cwt. This, with several others, is in the museum at Berne. Ebel again says that the greatest is in

the Paris museum, 3½ feet diameter, 2½ feet in length, one of its six faces being 1½ feet across, and of the purest water. The fact, however, is undoubted of the finding of the grotto, and an enormous quantity of crystals.

In 1757, some magnificent pieces were taken out of a grotto in the Viesch Thal, weighing, respectively, 50, 600, 800, and 1,400 lbs. (!) Two of the largest were sent in 1799, (the period of the French occupation), to the museum at Paris.

Between 1770-1780, 5,000 lbs. of crystals were got out of a grotto, in the hill of Hegdorn, above Naters, near the Aletsch glacier, amongst which were some ranging from 700 to 1400 lbs.

The fact that so few of these great pieces are found in collections, is probably due to ignorance of their existence, and the demand for the article, particularly in Milan, for the purpose of ornamental manufacture.

For nearly 90 years no other notable find took place. The next and latest brings us to 1867. In the summer of that year Herr Lindt and his brother, accompanied by Peter and Andreas Sulzer of Guttannen, crossed the Tiefen Sattel, a depression in the ridge N. of the Galenstock. Whilst resting on the Tiefen Glacier below they observed on the cliff of the Gletschhorn a band of quartz 50 or 60 feet long and varying in width from a few inches to 10 or 12 feet. At one part of this about 100 feet above the glacier, several dark spots were visible between the quartz and granite. These the keen eyes of the guides discerned to be holes and they asserted confidently that crystals must be there. The weather changing for the worse and the late hour of the day prevented any attempt at examination. It was indeed doubtful whether it was possible to reach the spot. A fortnight later the two Sulzers came again, and Andreas, a daring climber, succeeded in getting up, but a storm prevented any sufficient inspection and they returned empty handed.

In the summer of 1868 the work was resumed by Andreas Sulzer with three other men of Guttannen, and in August the first large piece of 15 lbs. weight was got out. Others came to help and with renewed spirits they set to work to enlarge the entrance of a second hole of some 8 or 9 inches aperture. It was no easy matter to use the mallet and boring iron on the narrow granite ledge. Through the long night the wind howled round them, threatening to whirl them from the rocks: hail and rain chilled their limbs in their scanty summer clothing. Half despairing of safety they clung to each other, unable to warm themselves by exercise, without any sufficient supply of stimulating drink or nourishing food. Less hardy natures would have succumbed, but perseverance carried them through. They worked incessantly from Saturday till Monday, and after two unsuccessful blasts, the third shot exploded inwards and enlarged the opening sufficiently to give entrance to a grotto of considerable size. This was filled almost to the roof with an earthy

chlorite-like rubbish mixed with pieces of quartz and granite. On the top of the rubbish lay a flat white layer of granite which obviously had fallen in large plates from the top. After enough of the earth had been cleared out to admit of their creeping in, by stirring and digging about they soon came upon crystals of smoky quartz (Rauch-topas). These lay loosely and irregularly, some with their points up, others down, in all positions. Some were magnificent cabinet specimens, in all respects perfect, others damaged probably by falling from the roof, others imperfectly developed. All were of an intensely dark colour, belonging to the variety much esteemed in the trade, and known as the Morio. The mirror-like brightness of the surfaces was remarkable, resembling coal black polished marble. The crystals were almost all separate; many of considerable weight. There were more than 50 between 1—200 lbs., nearly 20 over 200 lbs. and two over 300 lbs. The whole was estimated at from 25—30000 lbs. These weights did not rival those of earlier discoveries. The find was however undoubtedly the greatest for a century, and for smoky quartz it was unique.

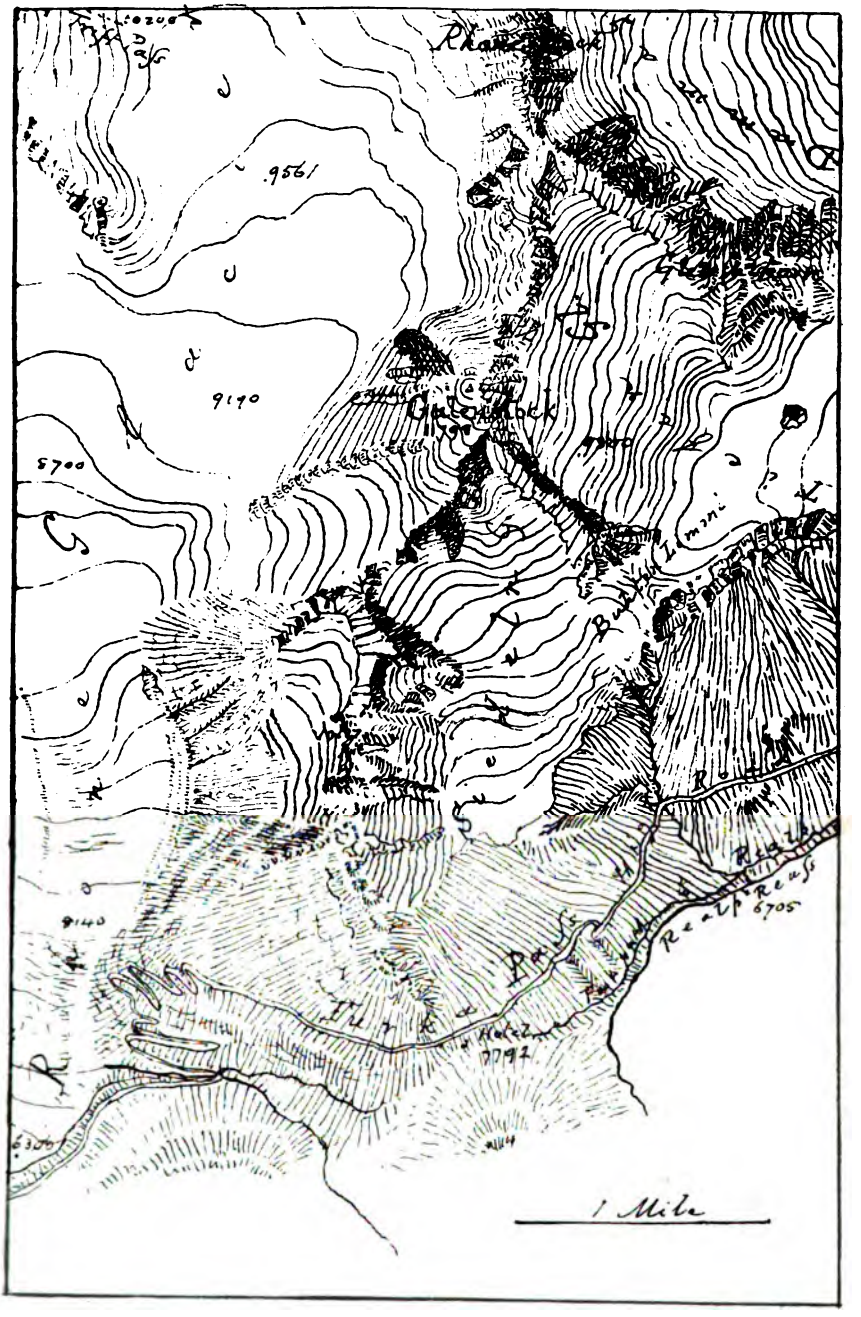
The news of this spread like wildfire and after the first 10 men had got out some 20 cwt., the whole able-bodied population of Guttannen, some 70 strong, was at the spot. Within a week the place was so completely cleared out, that Herr Lindt himself could with some trouble find a piece as big as his fist. The smaller pieces were thrown down on the glacier: the larger pieces, at least whilst they worked carefully, were secured in bags, and lowered down with a guiding rope to keep them from striking the rock. Loads of 100 lbs. weight were carried in baskets on men's backs, the larger pieces on sledges over the crevassed Tiefen glacier, and down the steep slopes of grass and rock to the upper house of refuge on the Furka road. Thence they were removed by the landlord of the Grimsel to Oberwald in Wallis. A report soon arose that the people of the Urseren Thal meant to stop the passage by the Furka, and levy a heavy toll upon them. To avoid this route more than 1500 lbs. were carried over the Buhlenlimmi, the Sielden and Rhone glaciers, and the Nagelis Gratli to the Grimsel. The dread of interruption made the work of clearing out proceed with feverish haste. Hardly an eye was closed in sleep; the dangerous transport continued night and day. It was a wonder that no life was lost; one man, heavily laden, fell into a crevasse to a depth of 50 feet, but was fortunately able to extricate himself without material injury; another nearly slipped through an ill-made knot when being drawn up to the hole.

At last came an order from the authorities of Canton Uri, to stop those pieces yet remaining within its limits. Three large pieces were thus detained, one weighing 267 lbs. Whatever justice the claim thus made may have had, it was certainly unjust for the Canton to sell its rights to a private person. It made over its claims to Herr Sebastian Müller, the landlord of the

Furka Inn, for 1800 francs. He used his power unscrupulously, and besides detaining the pieces mentioned above he extorted from the men of Guttannen 8,500 francs, (£340) a sum the more exorbitant as the value of the crystals fell far short of the first estimate.

Herr Lindt found the approach to the holes difficult. The glacier at the foot of the cliff forms a great curling ridge, down which you must approach the foot of the rock, and then make your way to the hole over ledges and projections a few inches in width. It was no easy business: only the best and boldest climbers could get up unassisted. Two places in particular required skill and surefootedness. The first was a perpendicular slab of granite quite smooth and so high that a tall man could just get his fingers over the upper edge; there was not room for two to stand at the foot and so by this slight hold only the first man must raise himself up. Shorter and weaker visitors had the aid of the rope, which has enabled many an indifferent climber to pass a spot he would never have thought of facing without it. The next difficulty was the passing of a round projecting knob of granite which required very great exertions and much power of sticking: the first man had to hang backwards over the precipice below almost like a fly on a ceiling: a rope was then stretched round the rock for a balustrade, whilst the followers had also the security of another rope round the waist. Even with these aids it required a smart exertion of strength to get round without losing hold. To add to Herr Lindt's discomfort, the weather was bad at the time, the rocks were fringed with icicles; every now and then a violent blast swept up over them the loose snow from the glaciers, which melted again on them and on the rocks in wet of icy coldness; they were all glad to reach the hole, their fingers were so benumbed as to be almost useless. Andreas led the way into the largest of the three openings, creeping in feet first. It was only 2 feet broad by 1½ feet high. The floor of the cave is several feet below the entrance, and is perfectly dry, though if water by any means found entrance, it could not flow out again. The height at the entrance 6 feet, diminishing to 2 or 3 at the farther end, length 18 feet and breadth 15 feet; one night 19 workmen slept (?) in it. The limit between the quartz and granite was plainly visible. No bases or roots of crystals were observed on the roof, so that most of them must have been attached to it and have fallen when the stone was disintegrated by the action of the air. Two large masses of lead ore (Bleiglanz) were found, covered with a crust of Laumontite. Salpho-carbonate of lead was also found on the ore, and oxyde of lead was discovered in several places.

The heaviest of the Morio crystals weighed 267 lbs. Its length was 2¼ feet, with a diameter of 13 inches, and it was beautifully formed. Three of the surfaces of the pyramid were, as usual, alternately greater than the other three. The change from pyramid to prism was not sharply defined on the




I'he Galenstock
and its
surrounding Glaciers

lower part, so that the crystal there assumed a rounded bulging shape. The base was pure transparent quartz, gradually passing into smoky quartz and the colour was most intense at the point. The lower part of the smoky quartz was mottled with transparent spots, the upper with dark cloudy ones. The planes of the prisms were marked by straight lines parallel to the base like rings of growth: the faces of the pyramid displayed a mirror like brightness and the finest polish. This, with 10 others ranging from 255 lbs. to 125 lbs., have been placed in the Museum at Berne. In the village of Oberwald were 10 others from 200 lbs. to 64 lbs. Two of these were perfect, and the rest though slightly damaged were well fitted for collections. Here also were the two largest weighing each above 300 lbs. but with broken points and covered with chlorite.

A private firm and others had at Oberwald and Guttannen from 60 to 70 pieces over 30 lbs., and 30 others between 3 and 30 lbs.

The remainder which amounted to nearly 13,000 lbs. was only fit for the cutter and polisher.

The discoverers were first of all disposed to set an extravagant value upon the crystals, and this difficulty rendered almost all dealing impossible. But when experts assured them that the best were not worth so much, and that much was of little value even to the manufacturer, they came down to more reasonable terms, 7 francs a lb. for good pieces, and 2—4 francs a lb. for broken ones.

This discovery has made the village of Guttannen for a time the envy of its neighbours. Many bickerings have unfortunately arisen amongst themselves, from the difficulty of adjusting the claims of the discoverers and their assistants to the crystals and the profits of them. It is to be hoped however that in the end the benefits will be great; and that many of the families will find their comforts and happiness largely increased. Those who have seen the village, with its patches of cultivated land separated by heaps of stones, scantily planted with potatoes or cabbage, and have observed on that desolate region the struggle which man has to carry on with nature will not be envious, but rather thank the Providence which has granted such a piece of good fortune to so poor a section of the human family.

W. D. Fenning was elected Secretary, and J. B. Fuller on the Committee, in the place of G. E. Manisty, who had left the School. F. E. Hulme, Esq., F.L.S., was elected an Honorary Member.

There were 32 persons present—3 Honorary Members, 15 Members, and 14 Visitors.

## MEETING HELD JUNE 3RD, 1870.

The minutes of the previous meeting were read and confirmed.

*Geology.*—H. C. Spry presented two very fine quartz crystals.

*Archæology.*—H. C. Spry presented two Idols from a temple in Birmah. When passing through Allahabad the larger one (of wood) was worshipped by the natives. Similar idols are frequently filled with jewels, though this appears to consist of a solid block of wood.

*Entomology.*—J. B. Fuller passed round a list of notices since the last meeting.

*Ornithology.*—E. L. Hesketh passed round a list of notices, including that of the black-headed bunting (*Emberiza schæniclus*). The President exhibited a specimen of the Lesser Spotted Woodpecker (*Picus minor*), captured in Savernake Forest, and of the Wheatear (*Saxicola Œnanthe*) picked up on Totterdown, March 28, 1870, by Mr. Coleman. Also a hen's egg with two yolks. Mr. Parker had shortly before met with a double hen's egg, having one complete egg with a hard shell inside another with a soft shell.

*Botany.*—The President announced the discovery of four plants, new to the College List, and exhibited a specimen of Gulf-weed (*Sargassum bacciferum*), a lump of prepared figs from the Caucasus, and the fruit of some palm picked up after a storm near Madagascar.

H. R. Armstrong mentioned having seen the shoots of a briar growing down to the bottom of a pond 4 feet deep, and there taking root and sprouting under water.

*Library.*—The receipt of the usual periodicals was announced; also the donation of the Journal of the Linnæan Society, by F. E. Hulme, Esq., F.L.S., and of the 3rd Report of the Rugby School Natural History Society, by the Society.

J. B. Fuller read the following paper on

## ROMAN REMAINS OF SILCHESTER.

The Roman town of Silchester, or as it was then called, Calleva, is situated on the ancient London road, near Reading. It was not originally founded by the Romans, but was by them taken from the Attrebutes, a Belgic tribe, of whom it was the chief city. The walls enclose an area forming an irregular pentagon in shape, and about 3 miles in circuit. They are composed of 7 bands of masonry, each 3 feet deep, thus forming a wall 21 feet in height, and are about 7 feet thick. Indications of a British fosse are to be seen outside, and there were also some Roman earthworks immediately within the walls. From

this it will be seen, that, on the capture of the town by the Romans, they built a wall inside the ancient British fosse, which was left untouched. Its capture took place very early in the occupation of Britain by the Romans, probably from its being an excellent place for signalling to Southampton, which was then the "Portus Magnus," by beacon.

Through the town from north to south ran the road from the north of Britain to Winchester, which branched off to Old Sarum shortly after leaving the south gate. The road between London and Bath through Corinium cut this at right angles, and in one of the angles formed by the intersection stood the forum.

The site of Calleva has been known for some time, but it is only within the last five or six years that the excavations have been regularly begun.

The ruins were discovered on land belonging to the Duke of Wellington, who, with the assistance of Mr. Joyce, to whose great abilities as an antiquary the success of the investigations is in great measure owing, has prosecuted the discoveries with great spirit. The excavations form five groups, two of which, being of an unimportant nature compared to the others, have been filled up again. Of the three others, the first is a large private house situated on the east side of the Winchester or north road in an angle which a smaller street makes with it.

It consists of an atrium opening into a large central hall, round 3 sides of which there run passages, which separate it from the smaller rooms. In it was discovered a small hypocaust, in which some remains of the small tile pillars, which supported the pavement of the room above, were found. There was also a second hypocaust in connection with, and receiving its heat from, the first, which warmed the triclinium or dining room. In it the heat was conducted under the floor, by a series of paved channels, running from the centre to the sides of the room, and then leading by flues up inside the walls. One of the earthenware flue pipes can still be seen in its place.

Behind these hypocausts there was the furnace which heated them, and a small room, in all probability the apartment of the slave, whose duty it was to attend to the fires. In this a broken strigil was found. In another room, probably a sleeping apartment, the lock, hinges, and iron bindings of a strong box were found. From their position it is almost certain that the box to which they belonged was, for security, imbedded in the floor; possibly the owner of the house slept over it.

Most of the rooms were paved with little earthenware bricks about 1 inch cube in size. In the passages these were sometimes of two colours, red and purple, arranged so as to form three alternate bands of each colour, running down the passage. In some places the pavement has been mended with large paving tiles, evidently at a later date, when the manufacture of the

smaller tiles had become either unknown or disused. A few more rooms, which appear to have been added some time after the house was first built, are entirely paved with these large tiles, some octagonal, and some square in shape. A small bit of tesselated pavement, about 3 feet square, much injured by the plough, in consequence of being very near the surface, was the only thing of note found in this house.

The second house, or block, as it is called, was situated in an angle formed by the Winchester road and a minor street, which ran out from it, 15 feet in breadth. It was an exceedingly large one and must have belonged to one of the principal officers of the town. Another proof of its importance is given by the fact of its being situated so near the forum, as both stood on the north road not quite 120 yards apart. This house is most interesting, not only from its size, but also from its shewing with great distinctness the alterations which it received at different intervals from the time, in which the town was first conquered, to the evacuation of Britain by the Romans; for on careful examination remains of older walls were found underlying the upper ones, and afterwards it became plain that beneath the surface of the same area there lay the lines of no less than 4 different houses, built one above the other in succession. The date of each could be roughly determined by the coinage found on each level. Of course this could not be considered as an infallible guide, because coins continued to circulate some time after the death of the Emperor, in whose name they were issued, but it might be an index which would greatly help us to determine the date of each erection. From this it appeared that the lowest and oldest building was of the reign of Claudius the First, or Domitian, the second structure was made by erasing some of the lines of the galleries, and was probably of the time of Commodus. At this time some very important features of the house were introduced. A very curious hypocaust to warm a sitting room 20 feet square, and two pretty good pieces of tesselated pavement, one of which was removed in a very perfect state to the hall of the Duke's residence at Stratfieldsaye. The other had been very much injured by the plough.

The third rebuilding of the house can be easily distinguished from the fact, that in it the new structure, though retaining the position of many of the rooms in the older house, was altered in its relation to the cardinal points, being shifted round a few feet at the North West angle, so that the lines of the two houses were not square with each other. This alteration was probably of the time of Claudius Gothicus, a great number of his coins and of his predecessors being found there.

In the fourth and last state of the house, the walls were built in a manner very inferior to those in the preceding ones, being merely composed of courses of flints set in black mud, mortar having been used in the other ones. In this

structure six large rooms were built facing the North road, and, from their size and similarity to those at Pompeii, they may be with justice considered to be shops let by the wealthy owner of the house to tradesmen.

In one of these rooms a tile work base of something was discovered, which from its shape may have been the furnace of an artizan.

The date of these alterations may have been about the end of the reign of Diocletian, perhaps near the time when Constantius Chlorus came over to Britain to quell the revolt of Allectus.—A most distinct proof of the different alterations in this house is that, when, in the second structure, a hypocaust was built, the anteroom to the triclinium, which it warmed, was built over one of the old walls. When by the lapse of time the pavement of the room sunk, it remained at its original level, where it was supported by the underlying wall, there being thus a ridge running throughout the floor. In one of the hypocausts, for there were two in this house, the connection between the flues and the furnace was effected by an arch of tiles, the greater part of which still remains.

In general shape this house differs from those at Pompeii in having no atrium, a change from the usual form of Roman houses, which was probably effected by the climate, for a hall open in the centre of the roof, as an atrium was, would admit of too much ventilation in the rooms and galleries to be agreeable. The length of the house along its principal front, facing the North road, is 150 feet, along the other side, facing the minor street, 110 feet.

This house is connected with the forum by the Winchester or North road. At the Southwest corner of the forum, in the angle formed by the junction of the North and London roads, probably stood a precinct with the altar of the Segontiac Hercules, the dedicatory inscription of which was found there about the middle of last century. It was an oblong stone tablet set in brass. Running up the west side of the forum was an ambulatory or penthouse, roofed with large bluish coloured tiles. On the inner side of the ambulatory were a series of large rooms which are supposed to have been public offices of some sort or other. The floor level of one of them is much higher than that of the others, and is apsidal instead of rectangular in shape. It was probably the chamber in which the Decurion, by which the affairs of most of the smaller towns were transacted, held their sittings.

Another, from a leaden seal, such as were then attached to records, having been found there, is called the record office.

In all of these rooms the floors were covered with charcoal, which proves that this part of the town at least had been burnt down. In the room which stood at the head of the ambulatory a bronze of beautiful execution was found imbedded in the charcoal. It was a Roman eagle, with its vertical wings torn off, 9 inches long. By a careful comparison of this most curious

relic with the sculptures on Trajan's pillar, and from the strict mode in treating the bird, both with regard to its plumage, and its proportionate relation to the size of the human body as observed in the sculptures of the Aquilifers or standard bearers of the Legions, it appears more than probable that this is indeed a veritable legionary eagle, with its staff and vertical wings torn off in some desperate struggle, and then hid in the beams of the house, which accounts for its having been found in the midst of the heap of charcoal, with which this and a great many other rooms was partially filled.

Adjoining these offices, at the southwest corner of the forum, the Basilica or law-court stands. This building was in earlier Roman times merely a roof supported on two rows of pillars, and therefore because it was quite exposed to the atmosphere Vitruvius directs that it should be placed at the warmest corner of the forum. But as the Romans became more civilised and therefore more effeminate, a wall was substituted for the pillars, which were only retained inside, or if any still remained outside, they were only used to decorate the Pronaos or entrance.

It was therefore divided into three aisles by these two rows of pillars, which also were used to support galleries for spectators over the two side aisles. At one end there was a raised place divided off from the rest of the court, in which the curule chair was placed, and round which the judices, who sometimes amounted to 180 in number, sat. On each side of this tribunal there were generally small chambers for the judices, called Chalcidica.

Later, when the Basilicæ, instead of being merely law-courts, came to have more of the properties of corn exchanges, the tribunal was thrown out of the terminal wall, generally in the shape of an apse, so as to seclude the judices more from the noise and confusion in the body of the Basilica.

You must have all noticed from the description I have just given, that the general shape and arrangement of our modern churches is almost entirely taken from the Roman Basilicæ, some of which indeed were converted into churches at the time when Christianity began to spread throughout the Roman Empire.

The Basilica of Silchester, although it has the later introduction of the external walls, yet keeps to the old custom in being situated at the warmest corner of the forum. It also has the external or apsidal tribunal. The chord of the semicircle is 26 feet across, and the apsidal wall is four feet six inches thick. On each side of the tribunal are the chambers or Chalcidica: one of which, however, is very much larger than the other. In front of the tribune stood the Bema, a Grecian introduction, from which the orators addressed the people. It was fronted with thin slabs of Purbeck marble, portions of which were still found adhering to it. Indications of the two rows of columns can be still traced, one row, however, being much plainer than the other, which has almost

entirely disappeared. The other end originally terminated in an apse, remains of which can be seen underlying the later walls, but it was at a later date made rectangular.

Eastwards from the Basilica there extends a series of rooms alternately square and apsidal in shape. They were probably public offices of some kind or other.

The forum is bounded on the other two sides by ambulatories within the tabernæ or shops. In one of these a deep hole, thought to be a well, was found.

The forum itself, that is the open centre area and the buildings with which it is immediately surrounded, forms a rectangular mass not quite square. Its two longer sides are 319 feet in length, its two shorter, 275 feet.

There was an entrance into the open area, which was used as a market place, about the middle of each side.

The most remarkable relics found here besides what have been already noticed, were, a glass cup very much resembling in shape a common tumbler, but of very thin glass, which was found in a very perfect state in the forum, a great many locks, keys, hinges, and also some bracelets and rings. On some of the building tiles and rougher sorts of pottery, there were impressions of dog's feet, caused by the animals walking over them before they were baked.

The coinage varies from Vespasian, A.D. 70, to Honorius, A.D. 393. A few of the reign of Augustus were found, which, however, could hardly have been in circulation at the time. On the reverse of some of the later coins, those of Magentius among others, the christian symbol "XP" with the Greek letters "A" and "Ω" on each side of it, was stamped.

A great many different kinds of pottery were found, some beautifully marked Samian ware among others. This ware is a very compact glazed red pottery, and it was at that time the best kind made.

I must now conclude by saying that for the most part I owe this paper to the kind help of Mr. Joyce, and to the lecture which he gave on the subject before the Society of Antiquaries last year. I must also hope that you will excuse any archæological inaccuracies that have been made, on the score of my ignorance of that branch of natural science, which I should never have chosen for the subject of my paper to-night, had not circumstances afforded me such ample opportunities for investigating the relics of that interesting Roman colony,—Silchester.

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The President then read part of Chapter iv. of Mr. Penrose's paper on "Bird Life."

There were 41 persons present, 2 Honorary Members, 17 Members, 1 Medius Socius, and 21 Visitors.

## MEETING HELD JUNE 17TH, 1870.

THE minutes of the previous meeting were read and confirmed.

*Archæology.*—E. L. Hesketh presented to the Society some fine specimens of Samian ware from Smithfield, and some curiously coloured glass from the bed of the Thames.

*Botany.*—The President announced the discovery of about eight plants new to the College List.

F. E. Hulme, Esq., exhibited a leaf of the common nettle (*Urtica diocia*), the stalk of which was covered by a fungus and had thereby lost all its power of stinging.

*Entomology.*—J. B. Fuller passed round a list of notices recorded since the last meeting, and exhibited a specimen of the rare *Acentropus niveus*, captured on the canal at Wilcot.

C. A. Sladen exhibited a specimen of *Sirex Gigas* captured at Martinsell.

*Geology.*—E. Almack exhibited some fossil bones from the drift of the Thames near Hurley, and made some remarks on the best mode of preserving such specimens.

*Ornithology.*—E. L. Hesketh read out a list of notices and exhibited a remarkable nest of the Reed Warbler (*Salicaria arundinacea*), presented by H. T. King, and a minute hen's egg presented by S. W. Featherstone.

H. S. Sankey presented the ordinary dress of a South Australian woman.

W. D. Fenning read the following Paper written by F. Giles, Esq., a former member of the Society, on

# SOME FUNDAMENTAL PHYSICAL IDEAS.

THE object of Physics is usually said to be the investigation of the properties of bodies and the actions they exercise at great distances, and this is the simplest general definition. But to attempt a strict definition of a science is at once to become unintelligible, for a science cannot be defined by some marked characteristic as can a material object or a geometrical figure. In beginning the study of Physics therefore it is better to attain clear and accurate ideas of the objects with which the science has to do, than to strive after obscure definitions of its aim.

And first then what do we mean by space? We can very easily grasp lengths and distances. A length of one yard or of twelve yards is perfectly familiar to us, and we can as easily conceive the distance separating us from a point on the horizon, or even that which cuts us off from the sun or the stars. Similarly we can master areas, such as the surface of a lake or of the sea, and volumes, of a cubic foot of marble for instance, of a house or a mountain. Imagine then a cubic foot of marble suspended in a quantity of water; now if we take it away the water of course instantly fills up the place originally occupied by the marble; but suppose the water to be kept out in some way, or rather suppose the cube of marble abolished so that only its six faces are left to keep out the water. This volume where there is neither marble, water, nor anything else is *space*, it is the space formerly occupied by the cubic foot of marble, and we now suppose it destitute of all matter. What applies to one cubic foot of marble applies equally to larger volumes. We may imagine a mountain annihilated from its base to its topmost peak, and the mind may still preserve an idea of its volume or of the space which it occupied. In the same way it requires no greater mental effort to conceive the volume of the earth than to master the volume of a marble or a cannon ball.

Above our heads is the atmosphere and above the atmosphere is the void of heaven. Into these regions also our minds may soar and weary themselves by searching it in all directions; they will meet with bodies analogous to the earth but separated by vast tracts of space. The vault of heaven is purely an illusion, and possessed of no solidity, but were it hard as adamant it could offer no check to the intellect which would plumb its very depths and traverse space beyond the stars; its range is limitless; it embraces infinite distance and has glimmerings of something yet more grand. Thus we apprehend infinite space and as a consequence space is actually infinite.

It is often said that man derives the ideas of succession and *time* from the contemplation of the phenomena of nature. Thus spring succeeds to winter and day to night, giving him the idea of succession; he may see time repre-

sented in the continuous flow of a river or the ceaseless tides of the ocean. But there is no need for any external phenomenon or any action on our senses to inspire us with the idea of time : we think and are conscious of our thoughts, they follow each other, and at once we have succession and continuity. No doubt this internal action does not enable us to count the hours, the days, or the years ; but the possession of the idea of time and the possession of the means of measuring it are two very different things. All external motion might be suspended, the stars might stop in their courses, the clouds become motionless, the flow of water cease, and in the midst of the universal repose we should still know that time was divisible although we should no longer possess the means of dividing it.

The ideas of space and time permeate all our perceptions, chaos, an absolute void is inconceivable to us, or rather when we try to imagine it we only imagine space and time.

The idea of space is complete and perfect in itself, that is to say we can conceive space and nothing in that space ; but it is not an exclusive idea forbidding association with any other. In space we can conceive *impenetrability* and impenetrability is *matter*. It is wrong to say that matter is gifted with two essential properties, extension and impenetrability, they are not properties but a definition. Impenetrability once conceived is simply called matter. We can picture to ourselves limited or infinite space, and similarly we can understand limited or infinite impenetrability, it may occupy a small volume like a drop of water or a volume as immense as the globe. Here we come upon another fundamental idea : we may imagine the impenetrability continuous and inseparable, or discontinuous and consequently separable. Inseparable penetrability is called an *atom*. The idea of greater or less magnitude has no effect on the conception of an atom any more than the idea of form ; we may conceive a very small or a very large atom ; we may conceive it round, square, pointed, or in any other strange form the imagination can invent. Only we must not suppose the whole world to be one great atom, nor matter to be all of one piece ; for the earth and the moon are two fragments of matter separated from each other, and we see matter on the earth's surface disintegrate and fall asunder, proving from our very definition that the earth is not an atom. Beyond this experience alone can guide us ; and all experience leads to the conclusion that matter is not indefinitely separable, but consists of portions of a size far below the appreciation of our senses which are absolutely inseparable, and are therefore true atoms. Recent discoveries seem to offer overwhelming proof of this and the view is now exclusively adopted.

A collection of atoms is called a *body*. In general bodies are of greater or less volume according as they contain a greater or less number of atoms ;

they are of different appearances if their component atoms are differently arranged; a still more marked difference exists where the atoms are of varying shape and size, and finally they are essentially unlike when their atoms are perfectly distinct.

In a given volume of a body, a ball of gold for example, we do not suppose all the atoms to be arranged alike, and all equally distant from each other; but we are led to imagine several atoms so grouped as to form a *molecule* or *particle*, and the grouping of the molecules in their turn imparts its structure and entirety to the body. Thus there is a greater distance between two molecules than between their component atoms. This is the sense strictly attaching to the words *molecules* and *particles*, which are almost synonymous; but they are sometimes used in another sense as in speaking of the vibration of the molecules of a sonorous body, or of their expansion under heat; we do not then refer strictly to each particular group of atoms, but loosely to small portions into which we mentally divide the body. By a similar misuse the word molecules is applied to the smallest fragments of a broken body.

The immense variety of bodies which come under our observation may all be divided into three classes; they are either *solids* like the rocks, the metals or the organic tissues; *liquids* as mercury, water, spirits of wine, or the animal fluids; or *gases* such as the air we breathe. Liquids and gases are sometimes grouped under the common name of *fluids*. It is worthy of remark that one and the same body may be at one time a solid as ice, at another a liquid as water, and finally a gas as steam. Changes such as these familiarize us with the idea that bodies are merely collections or congeries of atoms separated from each other by greater or less distances, and capable of acting in concert and communicating pressure or motion without touching each other.

Atoms merely placed side by side could not constitute either solid or any other bodies; they would only result in an incoherent mass like a heap of sand or dust. Now a stone or a piece of iron is a solid resisting body; there must, therefore, be something which holds the atoms together, which attaches them to each other and retains them in their places. Bodies would at once disintegrate if they consisted of atoms in simple juxtaposition, or rather no body could exist. All would be dust. We may imagine any atom in a piece of iron pressed against its neighbours, just as a block of stone is pressed against the ground; a certain effort is necessary to raise the stone; and could we seize the atom it would require a greater or less effort to tear it away. The *causes* of these *pressures* or *mutual actions* which the different portions of matter exercise on each other are *forces*.

Thus there are forces acting on the atoms of iron, which press them against each other, retain them in their places, and give to the whole mass the fixity we find in it.

Similarly, there are forces acting on the molecules of all solid bodies, giving them a determinate structure within and without, a permanent form. As there is no body destitute of a certain dependence between its parts, we conclude that wherever atoms approach each other mutual action is always set up by means of which they attract each other and assume a determinate structure.

Liquids, in spite of their mobility, have the same dependence between their parts : a drop of water has always a shape peculiar to itself whether seen on an ordinary surface, or deposited as dew on the foliage, or again suspended from the extremities of bodies. The form it takes results from the action of its component molecules, for without mutual action these molecules would instantly separate and fall away.

Air, invisible and subtle as it is, is no exception to this general law. It is impenetrable, for it offers resistance when enclosed in a bladder, a balloon, or any other receiver. Hence it too is composed of atoms and molecules ; and its different parts exercise a mutual action on each other : from thousands of phenomena which prove this take only that of respiration which is patent to us all. The external air enters the lungs just in proportion as the chest opens to receive it ; thus the molecules without act on the molecules within, they press on them and force them back, and when the air is enclosed in the chest, the molecules within react on each other and fill it out, just as they act on each other to fill the whole capacity of a receiver however great its size.

These forces continually acting within bodies between neighbouring molecules or between the atoms contained in a molecule are called *molecular forces* or *molecular attractions* ; they would be better named *molecular actions* or *atomic forces*, or perhaps the *constructive forces of bodies* since these forces really give to bodies their peculiar constructions and appearances.

But there are other forces besides molecular forces playing an active part in nature ; bodies fall when dropped, rivers flow ceaselessly, the sun appears to revolve round the earth ; these *motions* we observe, and our minds could conceive matter to *exist* had these motions never been produced. They are but accidental *effects* due to determinate causes. These causes of the displacement of bodies or *motions of translation* are also called *forces* or *powers*. They are no doubt connected with molecular forces, which can indeed in some cases impress motions of translation ; but they are usually kept apart from them.

There are two things essential to be considered in motion : its direction and its slowness or rapidity. If the moving body pursues a straight course the motion is *rectilinear*, and the straight course pursued by the moving body is the direction of the motion ; if, on the other hand, the body pursues any curve whatever the motion is curvilinear, and the curve pursued is the direction of the motion. But in this last case if we wish to express its direction at

any instant, it must be remembered that between any two points on a curve an infinite number of tangents, or straight lines, touching the curve, may be drawn; the moving body then being at one and the same time on the curve and on a tangent, the direction of its motion is said to be along the tangent on which it lies. Thus, in curvilinear motion, the moving body is perpetually changing direction, and if it describes a complete circle, it has actually passed through all the directions possible in one plane. As to the slowness or rapidity of the motion, in mechanics as in ordinary language, motion is said to be slower when the moving body traverses less space in the same time, and more rapid when it traverses a greater space. Care must be taken, however, to ascertain whether the motion which is less rapid measured by the space traversed in a given second for instance, may not be more rapid with reference to the space traversed in an hour or a day; for one and the same motion may slacken or increase in rapidity in a long duration of time.

Absolute motion and absolute rest are purely mental conceptions: in the universe nothing is absolute to us, all is relative and conditional. Thus all the substances on the surface of the earth which appear most absolutely motionless to us are but enjoying relative repose. Trees are at rest in connection with mountains, and mountains are at rest in connection with the soil and the whole mass of the globe; but trees and mountains are carried round with us in the vast orbit of our planet, and with us traverse in a second ten times the space traversed in the same time by a ball hurled from a cannon. Yet, though we traverse space thus rapidly we can form no estimate of our absolute motion, we must first ascertain whether the sun is motionless in the centre of the heavenly system. Now, all investigation seems to shew that the sun carries the planets with it just as the earth carries with it its atmosphere and its clouds, its trees and its mountains. The sun itself is but an invisible planet compared with another sun round which it circles, and this other sun is no doubt also whirled round in space, so that we cannot point out or even imagine any fixed centre round which all these revolutions take place.

We may conceive the forces acting on inorganic matter in two lights. We may suppose them endowed with a separate existence independent of matter; or we may admit them to be inherent in matter itself, mere permanent properties given to it when it came into being. These two hypotheses come in the end to one and the same thing; but whatever idea we may adopt as to the origin of forces and their mode of existence, they, with matter, are controlled by two fundamental principles witnessed to by all the phenomena nature is perpetually offering in frequent recurrence or long continued duration to our observation. These two principles constitute what is called the *inertia* of matter. The first is—if all the forces acting on matter cease at

a given instant, the matter preserves its state of rest or motion. The second is that all forces are governed by immutable laws. It results from the first principle that an atom of matter can neither acquire motion to itself nor change that which it has already received; and if two atoms of matter communicate motion to each other by their attractions or mutual action of any kind, the motion for instance communicated to a stone, unsupported by the hand, by the earth's attraction, it results from the second principle that such motion will be produced according to a determinate law which has suffered no change from the beginning of things. Thus whatever changes matter under undergoes whether in its condition, in its state of rest or its motion we must attribute to special causes or forces: sometimes to new forces which suddenly come into action; sometimes to permament forces, which continue to act, and are regulated in their action under the control of immutable laws. Whether a body is shattered or displaced, whether it hardens or softens, whether it cools or grows warm, whether it is liquified or vaporised, each and every change is due to the impression of a definite cause. No stone ever breaks of its own accord, or lifts itself from the ground; it has never become hard or soft, cold or hot, liquid or vapour, of its own agency. Cut the string which sustains it and it falls with ever increasing rapidity. A cause is necessary to induce its fall and the same cause continuing to act hastens its motion by repeating the effect. The earth as it revolves round the sun experiences perpetual changes: at one time its course is slower, at another more rapid, yet nothing is accidental in the periods of change, nothing is fortuitous or unforeseen. The same cause always governs the motion, but it varies in energy, and the law of this variation maintains the equilibrium of the universe.

The further then we investigate the phenomena of nature the more do we become impressed by their subjection to *law*. We regard chance as an impossibility, for we see that all is Cosmos, beautiful order. No reflection is better calculated to inspire man with a true appreciation of his own utter insignificance, while at the same time none is more likely to fill him with love for the supreme Being Who takes such fatherly care of the least of his creatures.

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H. Manders resigned. Captain H. O. Bateman, 43rd Regiment, was elected an Honorary Member, and S. C. V. Filleul, W. J. Gardner, and H. O. Yeatman, were elected Ordinary Members.

There were 42 persons present: 3 Honorary Members, 16 Members, 1 Medius Socius, and 22 Visitors.

## MEETING HELD JULY 1ST, 1870.

J. B. Fuller passed round a list of entomological notices obtained since the last meeting, and exhibited a pair of the Japanese Silk-worm Moth (*Bombyx Cecropia*).

The President exhibited a large box of Brazilian moths.

G. C. Mansel presented a typical nest of the Reed Warbler (*Sylvia arundinacea*).

E. Almack announced the presentation to the Society, by Dr. Fergus, of Simonin's "Underground Life," translated by Bristowe, for which a special vote of thanks was passed.

E. L. Hesketh read a paper on "Wasps."

There were 30 persons present, 1 Hon. Member, 16 Members, 1 Medius Socius, and 12 Visitors.

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## MEETING HELD JULY 15TH, 1870.

The Minutes of the last meeting were read and confirmed.

The President made a few remarks on the state of the Society's funds, and also noticed the want of energy in the Society.

J. B. Fuller passed round a list of Entomological notices obtained since the last meeting, including the capture of the Currant Clearwing Moth (*Trochilium Tipuliformis*) by Mr. W. Coleman.

E. L. Hesketh exhibited a fine specimen of the nest of the Willow Warbler (*Sylvia trochilus*) presented by A. C. Almack, Esq., a former Member of the Society.

The receipt of the usual periodicals was announced. The President read part of Chap. V. of "Bird Life."

There were 38 persons present, 1 Honorary Member, 13 Members, 1 Medius Socius, and 23 Visitors.

## MEETING HELD JULY 22ND, 1870.

The minutes of the preceding meeting were read and confirmed.

The heads of sections gave their reports for the half-year.

The President exhibited a large-sized Water Beetle (*Dytiscus Marginalis*), and some eggs of the common Grass Snake (*Natrix torquatus*), and made some remarks on the subject.

Also a case containing mounted specimens of the Gold and Silver Pheasants, presented to the Society by Mr. Gauntlett, head keeper of Savernake Forest.

A. M. Bell, Esq., then read the following paper on

## A DAY IN THE HIGHLANDS.

If the members of the Natural History Society expect any vast increase to their knowledge from the pages which I am about to read, I would advise them at once either to crush such hopes or at once to retire and bury themselves, deep as plummet can sound, in the histories of Thuanus, or the modest volumes of Coevier. I profess but little knowledge of the juvenescent buds of the *Pinguicula*: the monstrosities of *Poa alpina* have no interest for me: my acquaintance with beetles, I own it with more shame than regret, is but small, and I think I can tell more about the habits of Kittywakes and Tommy Norries than of *Fuligulæ* and *Thalassidromæ*. What I propose to do is to give some account of the scenery among the Aberdeenshire hills, with a few words it may be of the people to be met there, natives of course, not metics or aliens, with remarks interspersed on Alpine botany, which even to a superficial observer presents much worthy of interest. I know well enough that a constant habit of only roughly observing is not to be commended. I would quote in deep approbation the words of Sir Thomas Brown, Knight, of Norwich: "The wisdom of God receives small honour from those vulgar heads that rudely stare about, and with a gross rusticity admire his works; those highly magnifie him, whose judicious enquiry into his Acts, and deliberate research into his Creatures, return the duty of a devout and learned admiration." Still what I propose to do may not be without use to those among us who are juniors: to be able to distinguish between the Lady fern and the Alpine Polypody is I think as fruitful to habits of observation as to reason subtly on subjunctive and optative with or without ἄν; and there are moments of reflection which tell us that to have walked five and twenty miles with one's eyes open is as sure a source of pleasure, for all true pleasure is creative, as to have used those same sharp organs to score five and twenty runs at cricket.

However, without further preface, will the members of the Natural History Society kindly suppose themselves in the Castleton of Braemar. This town is so called from a castle or garrison set there in 1747, to prevent further commotion in the Highlands, for the men of Mar went out, as the saying was, for the old line of kings, as a great part of them still hold out for the older religion. It is a romantic conservation which gives these tribes their imaginative character and a wider sympathy than would be expected from men living in so lonely wastes, just as it is the prosaic side of the same conservation which makes them loll on the grass while their wives cut the corn, and see their children starve while the seas beside them are brimful of fish ready to be caught. This same Castleton also has been sung of by an English poet. At Castleton, says Clough, high in Braemar, are the clippingest places for bathing, a pre-eminence, which if my hearers follow me so far, ought to be granted to Rothiemurchus on Spaeside. The river in which Clough and his companions bathed is the Dee; the readers of Guy Mannering will remember

> Or are they the links of Forth, she said,
> Or are they the birks of Dee.

Indeed the birks or birch-woods of Dee are unsurpassed, and those whose minds rally round the court may bethink them of Balmoral some twelve miles down the river from the Castleton. But in this same Castleton we are delaying a most unconscionable time, and we have a considerable journey before us. On the opposite side of the river is a range of vast hills, the tops of each streaked in the lines of the rising streams with white snow, though it is now July of 1868, the hottest summer known in these parts since the '26, "and that was na so hot nather," an old man assured us, "of whom more anon, anon, sir." Ben Muich Dhui, the highest, broadest, massiest, and most distant to view of these peaks, we propose to climb, and then descend the other side of the range to the valley of the Spey. Our party consists of four; an Indian Captain who still feels his old freshness at the scent of the heather; his wife, the best and pluckiest of hill climbers, and a veteran member of the Apine Club who is familiar with more peaks and passes in the Alps and Pyrenees, than either I or I fancy the most of my hearers. We therefore, since we have full forty miles before us (and I hope the Natural History Society will not disdain to join me) start very prudently at 8.30 in the morning in a hired vehicle to take us to the foot of the hill. The road goes up the valley of the Dee and is overshadowed by forests of birch and Scotch-fir: the white bark and sweet smell of the one and the red bark and gnarled, wind-twisted, boles of the other are characteristic features of Highland scenery, nowhere found to greater advantage than in the valleys of

Braemar. In this twelve miles drive we pass a stream which has been described by Clough in the passage beginning:—

"There is a stream. I name not its name lest inquisitive tourist
Hunt it and make it a lion, and put it at last into guidebooks.
Springing far off from a loch unexplored in the folds of great mountains
Falling two miles through rowan and stunted alder, enveloped
Then for four more in a forest of pine where broad and ample
Spreads to convey it the glen with heathery slopes on both sides;"

and so on; I do not name the stream either partly because Clough tells us not, and partly because I don't know the name.

Two miles beyond this stream we passed the Linn of Dee

" where over rocks between rocks
Freed from prison the river comes pouring, rolling, rushing,
Then at a sudden descent goes sliding, gliding unbroken,
Falling, sliding, gliding in narrow space collected,
Save for a ripple at last, a sheeted descent unbroken,
Where to the element they offered their bodies down-shooting the fall, and
Mingled themselves with the flood and the force of imperious water."

So did not we, however, but drove on to the foot of the hill, where two ponies and two guides awaited us. The name of our eldest guide was Charles Stewart, a Roman Catholic, and for 300 years he told us his forefathers had lived where he lives now; the name of the other was Johnny Faa whose black face, names, and something of a merry wit spoke another than Celtic origin. The ponies also deserve a word of commendation; though slow they were sagacious. The ascent of Ben Muich Dhui is long and slow; we first go for near five miles up a valley called Glen Lui in which there is little ascent: the lower reaches of the valley are filled with magnificent Scotch firs, as on Deeside, under which I searched with great pains for the *Linnæa* which I make no doubt grows there, but was unable to find. It is a beautiful trailing plant with trumpeted flowers of light colour; Linnaeus gave as his reason that this plant should bear his name that it was a little northern plant, long overlooked, depressed and flowering early; but I make no doubt also that it is commoner in the forests of Sweden than in those of Scotland, and would vividly recall to Linné in his somewhat forlorn life in Paris and elsewhere the scenes of his boyhood and his father, the gardener's home. The upper part of Glen Lui is covered with the ruins of many houses; we also picked up a fine deer's horn which was lying in the grass. Of the policy which depopulated these valleys when there was no longer a prospect of a civil war to use men, and gave them over to sheep and deer, I do not mean to say a word. Scripture to be sure does say that a man is better than a sheep; the English aristocracy however, of whom we are all justly proud, say quite the contrary.

However let us hasten out of this valley of Glen Lui lest we plunge into the mires of contention, and like Joseph's brethren fall out by the way. After five miles of the glen are five miles of ascent before the top of the hill is reached. A steep climb of near 1000 feet brings us into the heart of the hill; there is now before us a deep blue tarn or lochan, as they are called in these parts, on the opposite side overhung by high rocks and encircled by bare and more or less steep hill sides of granite rocks. These tarns are common among the Cairngorm hills and have usually the same name Loch na neain, expressing their name, the loch of the shadows. It would seem now that we had passed the region of vegetation. It is not like one of the Perthshire Hills, Ben Ledi or Ben Lomond where you can climb on turf to the top. We are not near the region of vegetation. Our path is no longer on grass, heather or common rush. It is over granite stones or crumbled granite sand: the interstices are filled with soft dry moss, *sphagnum* or *hypnum* I believe. In the waters of the lake I saw the bell-shaped Lobelia peering above the surface, and doubtless at the bottom might have been found the *Isoetes* and perhaps the *Pilularia*. Above ground the commonest plant is the *Juncus trifidus*, a rush very rare except among the Breadalbane hills; it is a slender and beautiful plant. Green plots are also formed by the *Azalea procumbens*, a small and shrubby plant with pink flowers. There are also a good number of willows: many of my hearers I do not doubt picture to themselves stately trees drooping over the tarn we are passing, which notion is far from correct. The powers of winter, frost, and wind, which force as I have said the primeval granite to crumble away, hardly suffer any plant to rise above the ground. The willows I speak of are about three inches high, and very beautiful they are climbing over the rocks with green netted leaves and clusters of white catkins half covered in brown shells. A couple of miles past the lochan, and we reached the range of snow-covered runlets, where we were initiated into the peculiar beverage of the Alpine Club, of which, for my own part, I hope often again to partake, but do not intend to divulge. It was here, also, beside perpetual snow, that I found the specimen of *Luzula arcuata* which now graces the Marlborough Herbarium: it is a small drooping flowering rush, and glad I was to find it, as I had sought for him in vain on many hill-tops. Soon after we reached the top, which is broad and flat, bleaker, barer, and more crumbled than ever. It was a day of very great heat, so that there was a thick haze, and we had no distant view. We did not, however, think ourselves losers by this; the day before we had been up Lochnagar, another of the same range, and had had a day of perfect clearness. To-day, being among higher hills, we thought that the indistinctness with which they were seen added to their massive grandeur. We had no sight of the green banks or of the "birks of Dee:" opposite is

Brae Riach, the King's Steep, a rugged pile, if possible, vaster and barer than Ben Muich Dhui, on which we stand. Almost the only plants which grow at our feet are the parsley fern and the *Silene acaulis*, or mountain campion: it is perhaps the most beautiful of alpine flowers; it grows like in cushions of bright green starred over with pink flowers. Wordsworth, in his diary, laments that too inquisitive tourists had uprooted it altogether from Ingleborogh, where he had been wont to find it. I intend now to dismiss our alpine plants and descend as fast as may be to the valley of the Spey, but first I shall try and write the character of the mountain plants. They are all small and delicate in stem, and very bright, piercingly bright I might say, some in leaf and almost all in flower. Blue, white, yellow, pink, and purple, flowers:—the brightest always grow in the hills. I fancy it is owing to the great moisture of the soil and atmosphere, which saturates not only the leaf but the flower. When taken from their mountain crevices and put in gardens they lose their character: the leaves grow more profusely, and the flowers more abundant, but without the first freshness of colour.

Our descent into Speeside I mean to cut short, though it lasted for eight hours; the descent was long and steep, and, for our party, difficult. At four o'clock we were cheered to hear that we had full sixteen miles to walk, with no road, except, perhaps, for the last three. The first three were so rough that mounting the ponies was impossible, and the lady of our party, plucky to the last, began, it was plain, to be something tired. We are now at the source of the Dee, the top of the pass where, as the country people say, wind and water shear, the stream on one side flowing northwards to the Spey and on the other southwards to Brae Mar. The pass is one of the finest in Scotland, though but little known—its name is the Larig Ru, or Red Pass, from the red colour of the rocks on one side, now redder than ever in the setting sun. Slowly we descend with the winding stream to the moorlands. I must here stop for a moment to narrate that I here captured a fine beetle, the *cicindela*; it is of a respectable size and green in colour with yellow spots. Its legs are very long, so much so indeed that it is difficult to keep pace with it, even on the level ground. As we passed the moorland the banks of our stream began to be covered with the Scotch fir, under which again I fruitlessly sought for the *Linnæa*. Soon we were on the grass and heather of the plain, where we started a buck and a hind drinking. Next came an outlying farm, a welcome sight; it was the old farmer here who remembered the heat of 1826, and I hope he may long live to remember it. Here we eat scones fresh from the girdle, and drank of milk or cream rather, and were directed on our way. The way took us beside a lovely lake, whereon was an island, and on the island a castle, and on the castle we were told an eagle had hatched her young the winter before. At half-past nine o'clock, though it was still almost broad

daylight, we reached our inn, the "Boathouse of Rothiemurchus" it was called. It is a little quiet old-fashioned house, kept by a little quiet old-fashioned woman, on the banks of the Spey, which wound past in long and large pools. Though it was ten o'clock, bathing was irresistible, and not regretted:—then turning in, we supped on the porridge of the district, a wholesome diet, also provocative of sleep, where, not without invoking the Divine benison on days spent in the Highlands, as well as spent elsewhere, it may be well to leave us.

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There were 90 persons present, 4 Honorary Members, 17 Members, 1 Medius Socius, and 68 Visitors.

# ENTOMOLOGY.

THE list of Entomological Notices for this half-year is, perhaps, the longest that we have ever had. Although the break in the half-year, owing to the school leaving Marlborough for an Easter Vacation, of course did Entomology much harm, yet this has been much more than merely compensated for, by the half-year having been lengthened so far into the summer. But although the list is so good, we could hope for a little more general help from the members of the Society, as it will be seen that nearly all the notices have been obtained by the same few persons. At the same time it must be remembered that as the list only mentions *first* notices, the names of some helpers do not appear in consequence of their not being able to be the first discoverer of a moth.

Names of those whose initials occur in the following list.

| | |
|---|---|
| A.H.A. | A. H. Allen. |
| H.R.A. | H. R. Armstrong. |
| T.S.F.B. | T. S. F. Battersby. |
| H.B. | Rev. H. Bell. |
| A.M.B. | A. M. Bell, Esq. |
| P.C.B. | P. C. Bicknell. |
| A.C.C. | A. C. Champneys. |
| W.H.C. | W. H. Churchill. |
| W.C. | Mr. W. Coleman. |
| J.G.C. | Mr. J. G. Crow. |
| S.B.D. | S. B. Dixon, Esq. |
| J.W.D. | J. W. Dudding. |
| S.W.F. | S. W. Featherstone. |
| W.D.F. | W. D. Fenning. |
| S.C.V.F. | S. C. V. Fillenl. |
| J.E.F. | J. E. Fletcher. |
| J.B.F. | J. B. Fuller. |
| A.A.G. | A. A. Gill. |
| B.J.G. | B. J. Guillemard. |
| E.L.H. | E. L. Heaketh. |
| P.L.H. | P. L. Heaketh. |
| A.A.H. | A. A. Hoffmann. |
| F.E.H. | F. E. Hulme, Esq., F.L.S. |
| F.J.H.J. | F. J. H. Jenkinson. |
| W.H.M. | W. H. Macdonald, Esq., |
| W.M. | W. Mansell, Esq. |

| | |
|---|---|
| G.H.P. ... ... ... ... ... | G. H. Perry. |
| H.A.M.P. ... ... ... ... ... | H. A. M. Power. |
| H.S. ... ... ... ... ... | H. Sankey. |
| C.A.S. ... ... ... ... ... | C. A. Sladen. |
| S.J.S. ... ... ... ... ... | S. J. Soady. |
| J.S. ... ... ... ... ... | Rev. J. Sowerby. |
| F.S. ... ... ... ... ... | F. Storr, Esq. |
| F.E.T. ... ... ... ... ... | F. E. Thompson, Esq. |
| S.F.T. ... ... ... ... ... | S. F. Townsend. |
| H.J.V. ... ... ... ... ... | H. J. Verrall. |
| T.F.W. ... ... ... ... ... | T. F. Wilson. |

As usual an H added to the date signifies that the specimen was a hibernated one.

## RHOPALOCERA.

| | | | |
|---|---|---|---|
| Gonepteryx Rhamni ... ... | Brimstone ... ... | Mar. 17 ... | S.C.V.F. |
| Colias Edusa ... ... ... | Clouded Yellow ... | June 29 ... | C.A.S. |
| Pieris Brassicæ ... ... ... | Large White ... ... | March 31 | J.S. |
| P. Rapæ ... ... ... ... | Small White ... ... | April 1 ... | G.H.P.; T.F.W. |
| P. Napi ... ... ... ... | Green-veined White | April 12 ... | C.A.S. |
| Anthocharis Cardamines ... | Orange Tip ... ... | May 9 ... | C.A.S. |
| Lasiommata Ægeria ... ... | Wood Argus ... ... | May 26 ... | G.H.P. |
| L. Megæra ... ... ... ... | Wall Brown ... ... | May 15 ... | P,L.H. |
| Hipparchia Janira ... ... | Meadow Brown ... | June 14 ... | E.L.H. |
| H. Tithonus ... .. ... | Gatekeeper ... ... | July 7 ... | J.B.F. |
| H. Hyperanthus ... ... | Ringlet ... ... ... | June 25 ... | E.L.H. |
| H. Semele ... ... ... ... | Grayling ... ... | June 23 ... | C.A.S. |
| Cœnonympha Pamphilus... | Small Heath ... ... | May 16 ... | C.A.S. |
| Cynthia Cardui ... ... ... | Painted Lady ... | Mar. 17, H | E.L.H. |
| | this year's brood ... | July 10 ... | F.E.H. |
| | | June 3 ... | — Hunter. |
| Vanessa Atalanta ... ... | Red Admiral ... ... | April 23, H | C.A.S. |
| V. Polychlorus ... ... ... | Large Tortoiseshell | April 5, H | F.S. |
| | this year's brood... | July 20 ... | T.F.W. |
| V. Io ... ... ... ... ... | Peacock ... ... ... | Jan. 13, H | C.A.S. |
| | | Mar. 9, H | W.H.C.; A.H.A. |
| | this year's brood | May 26 ... | J.B.F. |
| V. Urticæ ... ... ... ... | Small Tortoiseshell | March 8, H | C.A.S. |
| | this year's brood | June 4 ... | G.H.P. |

| | | | |
|---|---|---|---|
| Argynnis Paphia ... ... | Silver-washed Fritillary ... ... | July 7 ... | G.H.P. |
| A. Adippe ... ... ... ... | High Brown Frit. ... | June 23 ... | B.J.G. |
| A. Aglaia ... ... ... ... | Dark-green Frit. ... | June 23 ... | C.A.S. |
| A. Euphrosyne ... ... ... | Pearl-bordered Frit. | May 16 ... | C.A.S. |
| A. Selene ... ... ... ... | Small Pearl-bordered Fritillary ... ... | June 2 ... | E.L.H. |
| Nemeobius Lucina ... ... | Duke of Burgundy Fritillary ... ... | June 14 ... | J.B.F. |
| Thecla Rubi ... ... ... | Green Hairstreak ... | June 1-7... | W.C. |
| Chrysophanus Phlœas ... | Small Copper... ... | May 15 ... | J.B.F. |
| Polyommatus Argiolus ... | Holly Blue ... seen<br>caught | April 16<br>April 18 | C.A.S. |
| | second brood... ... | July 20 ... | G.H.P. |
| P. Alsus ... ... ... ... | Bedford Blue ... ... | May 28 ... | J.B.F. |
| P. Alexis ... ... ... ... | Common Blue... ... | May 19 ... | P.L.H. |
| P. Corydon... ... ... ... | Chalk-hill Blue ... | June 23 ... | C.A.S. |
| P. Agestis ... ... ... ... | Brown Argus ... ... | May 27 ... | G.H.P. |
| Thymele Alveolus ... ... | Grizzled Skipper ... | May 18 ... | J.B.F. |
| Thanaos Tages ... ... ... | Dingy Skipper ... | May 18 ... | G.H.P. |
| Pamphila Sylvanus ... ... | Large Skipper ... | June 3 ... | W.M. |
| P. Linea ... ... ... ... | Small Skipper ... | June 25 ... | F.J.H.J. |

SPHINGINA.

| | | | |
|---|---|---|---|
| Procris Statices ... ... ... | Green Forester ... | May 26 ... | J.B.F. |
| Anthrocera Filipendulæ ... | Six Spotted Burnet | June 25 ... | J.B.F. |
| A. Loniceræ ... ... ... | Five Spotted Burnet | June 21 ... | J.S. |
| Smerinthus Populi .. ... | Poplar Hawk ... ... | June 3 ... | J.S. |
| S. Tiliæ ... ... ... ... | Lime Hawk ... ... | May 23 ... | J.B.F. |
| | larvæ, full grown | July 24-25 | S.F.T., S.J.S. |
| Sphinx Ligustri... ... ... | Privet Hawk ... ... | June 9 ... | H.R.A. |
| Chærocampa Elpenor ... | Large Elephant Hawk | June 6 ... | F.E.T. |
| C. Porcellus ... ... ... | Small Elephant Hawk | July 15 ... | T.F.W. |
| Macroglossa Stellatarum... | Humming-bird Hawk | June 16 ... | J.B.F. |
| Trochilium Tipuliforme ... | Currant Clearwing... | June 20 ... | W.C. |
| Sesia Bembeciformis... ... | Hornet Clearwing ... | June 25 ... | A.A.H. |

BOMBYCINA.

| | | | |
|---|---|---|---|
| Hepialus Lupulinus ... ... | Common Swift ... | May 25 ... | P.C.B. |
| H. Sylvinus ... ... ... | Wood Swift ... ... | May 25 ... | J.S. |
| H. Hectus ... ... ... ... | Golden Swift ... ... | July 19 ... | F.J.H.J. |
| H. Humuli ... ... .. ... | Ghost Swift ... ... | July 14 ... | C.A.S. |

| | | | |
|---|---|---|---|
| Dasychira Pudibunda ... | Pale Tussock (bred) | May 27 ... | J.B.F. |
| Nudaria Mundana ... ... | ... ... ... ... ... | July 22 ... | F.J.H.J.; W.M. |
| Lithosia Complanula... ... | Common Footman... | July 7 ... | J.B.F. |
| Arctia Caja .. ... ... ... | Garden Tiger ... ... | July 4 ... | H.B., A.M.B. |
| Nemeophila Plantaginis ... | Wood Tiger ... ... | May 26 ... | G.H.P. |
| Spilosoma Menthrasti ... | Ermine ... ... ... | May 27 ... | G.H.P. |
| S. Lubricepeda ... ... ... | Buff Ermine ... ... | May 29 ... | J.W.D. |
| Diaphora Mendica ... ... | Muslin ... ... ... | May 17 ... | H.S. |
| Callimorpha Jacobeæ ... | Cinnabar ... ... | May 8 ... | W.H.M. |
| Lasiocampa Quercus ... | Oak Eggar (larva)... | April 4 ... | C.A.S. |
| | | July 14 ... | S.J.S. |
| Eriogaster Lanestris... ... | larva ... ... ... | March 27 | C.A.S. |
| Odonestis Potatoria .. ... | Drinker ... ... ... | July 5 ... | G.H.P. |
| Cerura Vinula ... ... ... | Puss Moth ... ... | June 15 ... | W.C. |
| Lophopteryx Camelina ... | ... ... ... ... ... | June 25 ... | W.M. |
| Diloba Cæruleocephala ... | Figure of Eight (larva) | June 12 ... | G.H.P. |
| Cilix Spinula ... ... ... | Chinese Character... | May 21 ... | W.M. |
| | | July 15 ... | G.H.P. |
| Drepana Falcataria ... ... | Pebble Hooktip ... | May 28 ... | J.S. |
| D. Unguicula ... ... ... | Barred Hooktip ... | May 24 ... | J.B.F. |

NOCTUINA.

| | | | |
|---|---|---|---|
| Bryophila Perla... ... ... | Marbled Beauty ... | June 29 ... | W.M. |
| Acronycta Psi ... ... ... | Grey Dagger ... ... | June 22 ... | F.J.H.J. |
| Leucania Pallens ... ... | Wainscot... ... ... | June 26 ... | W.M. |
| L. Lithargyria ... ... ... | ... ... ... ... ... | July 12 ... | F.J.H.J. |
| Xylophasia Polyodon ... | ... ... ... ... ... | June 16 ... | W.M. |
| Heliophobus Popularis ... | Feathered Gothic ... | July 11 ... | S.W.F. |
| Mamestra Brassicæ ... ... | ... ... ... ... ... | June 1 ... | W.M. |
| Apamea Basilinea ... ... | ... ... ... ... ... | June 14 ... | F.J.H.J. |
| A. Unanimis ... ... ... | ... ... ... ... ... | July 18 ... | W.M. |
| A. Oculea ... ... ... ... | ... ... ... ... ... | July 9 ... | F.J.H.J. |
| Grammesia Trilinea ... ... | ... ... ... ... ... | June 3 ... | W.M. |
| Rusina Tenebrosa ... ... | ... ... ... ... ... | June 2 ... | W.M. |
| Agrotis Exclamationis ... | ... ... ... ... ... | June 14 ... | F.J.H.J. |
| Triphæna Pronuba ... ... | ... ... ... ... ... | June 3 ... | H.R.A. |
| T. Orbona ... ... ... ... | ... ... ... ... ... | July 14 ... | F.J.H.J. |
| Euplexia Lucipara ... ... | ... ... ... ... ... | June 23 ... | J.B.F. |
| Hadena Dentina ... ... | ... ... ... ... ... | June 21 ... | F.J.H.J. |
| H. Oleracea... ... ... ... | ... ... ... ... ... | June 21 ... | F.J.H.J. |
| Cucullia Umbratica ... ... | ... ... ... ... ... | June 28 ... | W.C. |

| | | | |
|---|---|---|---|
| Plusia Iota ... ... ... ... ... ... ... ... ... | | June 28 ... | W.C. |
| Grammesia Trilinea ... ... ... ... ... ... ... ... | | June 4 ... | W.M. |
| Cosmia Trapetzina ... ... ... ... ... ... ... ... | | July 25 ... | J.B.F. |
| Caradrina Cubicularis ... ... ... ... ... ... .. | | July 14 ... | (late) F.J.H.J. |
| Plusia Gamma ... ... ... | Silver Y ... ... ... | May 26 ... | C.A.S. |
| Gonoptera Libatrix ... ... | Herald ... ... ... | May 19 ... | W.M. |
| Mania Maura ... ... ... .. ... ... ... ... | | July 14 ... | S.W.F. |
| Euclidia Mi ... ... . . | Mother Shipton ... | May 21 ... | E.L.H. |

## GEOMETRINA.

| | | | |
|---|---|---|---|
| Ourapteryx Sambucata ... ... ... ... ... ... | | June 30 ... | A.A.G. |
| Rumia Crataegata ... ... ... ... ... ... ... | | May 21 ... | G.H.P. |
| Angerona Prunaria ... ... ... ... ... ... ... | | June 25 ... | B.J.G. |
| Metrocampa Margaritata ... ... ... ... ... ... | | July 15 ... | G.H.P. |
| Pericallia Syringaria ... ... ... ... ... ... | | July 15 ... | G.H.P. |
| Selenia Illunaria ... ... ... ... ... ... ... | | July 13 ... | F.J.H.J. |
| Amphidasis Betularia ... ... ... ... ... ... | | June 13 ... | W.C. |
| Boarmia Repandata ... ... ... ... ... ... ... | | July 1 ... | G.H.P. |
| Iodis Lactearia ... ... ... ... ... ... ... ... | | May 26 ... | C.A.S. |
| Ephyra Porata ... ... ... ... ... ... ... ... | | July 20 ... | W.M. |
| E. Punctata ... ... ... ... ... ... ... ... | | May 26 ... | J.B.F. |
| Asthena Luteata ... ... ... ... ... ... ... | | June 25 ... | F.J.H.J. |
| A. Candidata ... ... ... ... ... ... ... ... | | May 18 ... | J.B.F. |
| A. Sylvata ... ... ... ... ... ... ... ... ... | | June 14 ... | F.J.H.J. |
| Acidalia Scutulata ... ... ... ... ... ... ... | | July 8 ... | J.B.F. |
| A. Bisetata ... ... .. ... ... ... ... ... ... | | July 8 ... | G.H.P. |
| A. Trigeminata ... ... ... ... ... ... ... ... | | July 23 ... | J.B.F. |
| A. Remutata ... ... ... ... ... ... ... ... | | June 14 ... | F.J.H.J. |
| A. Imitaria ... ... ... ... ... ... ... ... | | July 13 ... | F.J.H.J. |
| A. Aversata ... ... ... ... ... ... ... ... | | June 4 ... | G.H.P. |
| Cabera Pusaria ... ... ... ... ... ... ... ... | | May 21 ... | E.L.H. |
| C. Exanthemaria ... ... ... ... ... ... ... | | May 21 ... | J.B.F. |
| Halia Wavaria ... ... ... ... ... ... ... ... | | July 15 ... | J.E.F. |
| Strenia Clathrata ... ... ... ... ... ... ... | | July 7 ... | E.L.H. |
| Lozogramma Petraria ... ... ... ... ... ... | | May 24 ... | G.H.P. |
| Minoa Euphorbiata ... ... ... ... ... ... ... | | June 2 ... | G.H.P. |
| Abraxas Grossulariata ... ... ... ... ... ... | | July 2 ... | G.H.P. |
| Ligdia Adustata ... ... ... ... ... ... ... | | July 7 ... | J.B F. |
| Lomaspilis Marginata ... ... ... ... ... ... | | May 24 ... | A.C.C. |
| Hibernia Rupicapraria ... ... ... ... | plentiful March 19 | | F.J.H.J. |

| | | |
|---|---|---|
| A. Progemmaria | March 20 | H. A. M. P., T.S.F.B. |
| Larentia Didymata | July 22 | F.J.H.J. |
| Coremia Pectinitaria | June 2 | J.B.F. |
| Emmelesia Affinitata | June 25 | F.J.H.J. |
| E. Alchemillata | July 14 | F.J.H.J. |
| Ypsipetes Elutata | July 14 | F.J.H.J. |
| Melanthia Rubiginata | June 30 | P.C.B. |
| Melanippe Unangulata | July 7 | J.B.F. |
| M. Rivata | May 21 | J.B.F. |
| M. Montanata | May 18 | J.B.F. |
| M. Fluctuata | May 15 | W.M. |
| Anticlea Rubidata | June 14 | F.J.H.J. |
| Camptogramma Bilineata | June 13 | G.H.P. |
| Scotosia Vetulata | July 14 | F.J.H.J. |
| S. Rhamnata | July 13 | F.J.H.J. |
| Cidaria Picata | June 25 | F.J.H.J. |
| C. Corylata | June 14 | G.H.P. |
| C. Russata | May 28 | G.H.P. |
| C. Prunata | July 6 | S.W.F. |
| C. Fulvata | June 29 | G.H.P. |
| C. Dotata | July 1 | W.M. |
| C. Pyraliata | July 7 | E.L.H. |
| Eubolia Mensuraria | July 14 | F.J.H J. |
| E. Plumbaria | June 4 | J.B.F. |
| Anaitis Plagiaria | June 16 | F.J.H.J. |
| Odezia Chærophyllata | June 2 | J.B.F. |

## PYRALIDINA.

| | | |
|---|---|---|
| Hypena Proboscidalis | July 14 | F.J.H.J. |
| Pyrausta Purpuralis | June 25 | F.J.H.J. |
| Cataclysta Lemnalis | July 24 | W.D.F. |
| Paraponyx Stratiotata | July 18 | F.J.H.J. |
| Acentropus niveus | June 6 | J.B.F. |
| Botys Verticalis | July 11 | F.J.H.J. |
| B. Urticata | May 27 | J.W.D. |
| B. Fuscalis | June 14 | F.J.H.J. |
| Ebulea Sambucalis | June 16 | F.J.H.J. |
| Scopula Olivalis | June 14 | F.J.H.J. |
| Aphomia Colonella | June 14 | F.J.H.J. |
| Crambus pinetellus | June 25 | F.J.H.J. |

### TINEINA.

| | | |
|---|---|---|
| Tinea Tapetzella ... ... ... ... ... ... ... | June 21 ... | F.J.H.J. |
| Adela de Geerella ... ... ... ... ... ... ... | June 14 ... | F.J.H.J. |
| Depressaria Applana... ... ... ... ... ... ... | March 17 | F.J.H.J. |
| Pterophorus Pentadactylus ... ... ... ... ... | June 2 ... | W.M. |

### OTHER NOTICES.

| | | |
|---|---|---|
| Wasp ... ... ... ... ... ... ... | March 1 ... ... ... | J.G.C. |
| Cock-chafer ... ... ... ... ... | March 5 ... | seen by H.R.A. |
| Lady-bird ... ... ... ... ... ... | March 10 ... ... ... | H.J.V. |
| Glow-worm ... ... ... ... ... | March 31 ... ... ... | S.B.D. |

## ORNITHOLOGICAL NOTICES.

NAMES of those whose initials occur in the following list:—

| | |
|---|---|
| A.G.B. ... ... ... ... ... | A. G. Bankart. |
| A.W.B. ... ... ... ... ... | A. W. Banks. |
| F.G.B. ... ... ... ... ... | F. G. Bond. |
| S.B. ... ... ... ... ... | S. Brown. |
| A.B. ... ... ... ... ... | A. Busk. |
| G.T.P.C. ... ... ... ... ... | G. T. P. Cambridge. |
| J.H.R.C. ... ... ... ... ... | J. H. R. Clark. |
| R.C. ... ... ... ... ... | R. Constable. |
| W.C. ... ... ... ... ... | Mr. W. Coleman. |
| J.G.C. ... ... ... ... ... | Mr. J. G. Crow. |
| C.E.D. ... ... ... ... ... | C. E. Down. |
| W.A.E. ... ... ... ... ... | W. A. Eckersley. |
| S.W.F. ... ... ... ... ... | S. W. Featherstone. |

| | |
|---|---|
| A.B.F. | A. B. Fenton. |
| S.C.V.F. | S. C. V. Filleul. |
| J.F. | J. Forster. |
| J.B.F. | J. B. Fuller. |
| R.G. | R. Geldard. |
| H.G. | H. Gordon. |
| S.W.G. | S. W. Greenhow. |
| J.G. | J. Grigg. |
| L.H. | L. Hart. |
| E.L.H. | E. L. Heaketh. |
| P.L.H. | P. L. Heaketh. |
| C.P.H. | C. P. Hooker. |
| A.H.J. | A. H. James. |
| L. | Lee. |
| H.M. | H. Manders. |
| G.C.M. | G. C. Mansel. |
| J.B.O. | J. B. Oakeley. |
| T.C.O. | T. C. Owen. |
| G.H.P. | G. H. Perry. |
| H.G.P. | Mr. H. G. Parker. |
| J.J.P. | J. J. Purdon. |
| E.E.R. | E. E. Robinson. |
| R. | Mr. Rushen. |
| G.J.S. | G. J. Scott. |
| C.A.S. | C. A. Sladen. |
| W.D.S. | W. D. Steel. |
| F.H.T. | F. H. Thirlwall. |
| W.H.W. | W. H. Williams. |

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Kestrel (Falco tinnunculus)—egg June 4th, L.

Sparrow Hawk (Accipiter nisus)—egg May 13th.

Tawny Owl (Syrnium stridula)—2 eggs laid about March 1st; 6 eggs (partially hard set) March 11th; 3 eggs (fresh) April 10th.

Red-backed Shrike (Lanius collurio)—egg May 31st, C.E.D.

Spotted Flycatcher (Muscicapa griseola)—seen April 15th, C.A.S.

Missel Thrush (Turdus viscivorus)—egg April 7th, S.W.F., & F.G.B.

Song Thrush (Turdus musicus)—on the 1st of March a Song Thrush had been sitting for a fortnight on 4 eggs (*Marlborough Times*).

Blackbird (Turdus merula)—3 eggs (hard set) April 8th, C.H.P. & A.G.B.

Ring Ouzel (Turdus torquatus)—seen April 9th, R.

Hedge Accentor (Accentor modularis)—4 eggs April 5th, J.G.C.

Redbreast (Erythaca rubecula)—egg May 12th, C.A.S.; 5 eggs June 3rd, A.B.

Redstart (Phœnicura ruticilla)—seen Feb. 6th, H.M. and J.H.B.C., and April 9th, R.; egg May 14th, G.T.P.C.

Whinchat (Saxicola rubetra)—seen April 21st, W.C.; egg June 4th, J.B.F. & G.H.P.

Wheatear (Saxicola œnanthe)—picked up dead March 28th, W.C.; egg May 19th, R.C.

Grasshopper Warbler (Salicaria locustella)—seen April 23rd, R.; egg May 26th, J.B.F. and G.H.P.

Sedge Warbler (Salicaria phragmitis)—seen May 12, J.G.C.; egg June 1st, J.B.O.

Reed Warbler (Salicaria arundinacea)—shot April 9th, R.; 5 eggs April 27th, C.A.S.

Nightingale (Philomela luscinia)—nest May 4th, J.B.F. and G.H.P.

Blackcap (Curruca atricapilla)—seen April 24th, R.

Garden Warbler (Curruca hortensis)—seen April 9th, R.; egg May 26th, E.E.R.

Greater Whitethroat (Curruca cinerea)—seen April 13th, C.A.S.; egg about May 26th, G.C.M.

Willow Warbler (Sylvia trochilus)—seen April 21st, W.C.; egg June 2nd, J.B.F., E.L.H.

Chiff-chaff (Sylvia rufa)—heard March 10th, S.C.V.F.

Golden-crested Regulus (Regulus cristatus)—egg April 28th.

Greater Tit (Parus major)—egg May 14th, G.T P.C.

Blue Tit (Parus cæruleus)—egg May 14th, G.T.P.C.

Cole Tit (Parus ater)—egg May 17th, A.H.J., and May 24th, L.H.

Pied Wagtail (Motacilla yarrellii)—pairing March 8th, E.L.H.

Sky Lark (Alauda arvensis)—egg May 12th, J.B.O.; young birds May 24th, J.B.F., E.L.H.

Common Bunting (Emberiza miliaria)—egg June 20th, J.B.O.

Black-headed Bunting (Emberiza schœniclus)—egg June 1st, J.B.O.

Yellow Bunting (Emberiza citrinella)—3 eggs May 14, T.C.O.; young birds May 13th, J.J.P., A.W.B., S.W.G.; egg July 14th, W.H.W.

Chaffinch (Fringilla cœlebs)—3 eggs April 25th, C.A.S.

House Sparrow (Passer domesticus)—building Feb. 23, H.G.; egg May 14th, J.B.O., S.C.V.F.

Common Linnet (Fringilla cannabina)—egg May 15th.

Green Finch (Coccothraustes chloris)—egg May 4th, C.A.S.; and June 16th (late), G.C.M.

Bullfinch (Pyrrhula vulgaris)—egg May 18th, J.B.O., G.H.P.

Crossbill (Loxia curvirostra)—seen March 8th, J.B.O., S.C.V.F.

Starling (Sturnus vulgaris)—egg April 11th, J.B.O.

Carrion Crow (Corvus corone)—4 eggs April 23rd, C.A.S.

Rook (Corvus frugilegus)—building March 1st; 3 eggs March 24th, J.B.O., W.D.S., J.G.

Jackdaw (Corvus monedula)—3 eggs April 6th, H.G.P.

Magpie (Pica caudata)—3 eggs April 13th, H.G.P.

Jay (Garrulus glandarius)—egg May 18th, J.B.F., G.H.P.

Green Woodpecker (Picus viridis) egg May 17th, J.B.O., S.C.V.F.

Greater Spotted Woodpecker (Picus major)—seen February 26th, J.B.O., S.C.V.F.; young birds June 10th.

Lesser Spotted Woodpecker (Picus minor)—seen April 8th.

Wren (Troglodytes vulgaris)—egg May 19th, R.G., J.F.

Nuthatch (Sitta europæa) egg April 23rd, W.C.

Cuckoo (Cuculus canorus)—heard April 9th, H.G.P.

Swallow (Hirundo rustica)—seen April 5th, J.G.C., April 7th, W.C.; egg June 3rd, J.B.F.

House Martin (Hirundo urbica)—seen April 6th, C.A.S.

Sand Martin (Hirundo riparia)—seen April 10th, R.; egg May 28th, C.A.S., E.L.H., J.B.O.

Swift (Cypselus apus)—seen April 18th, J.G.C.; egg June 14th, F.H.T.; 3 eggs June 15th, A.B.F. & W.A.E.

Ring Dove (Columba palumbus)—building March 31st, E.L.H., P.L.H.; 2 eggs April 12th, E.L.H., P.L.H.

Stock Dove (Columba œnas)—2 eggs April 7th, (partly set), R.C., S.B.

Turtle Dove (Columba turtur)—heard April 30th, R.

Pheasant (Phasianus colchicus)—egg May 14th, J.B.O.—"We consider it very early here by the 12th April," Mr. Gauntlett.

Partridge (Perdix cinerea)—3 eggs May 18th, S.C.V.F.; building March 21st, H.M.

Peewit (Vanellus cristatus)—7 eggs April 6th, H.G.P., six eggs from the same nest, April 11th, H.G.P., 3 eggs June 13th, G.J.S.

Heron (Ardea cinerea)—young birds April 20th, R.

Sandpiper (Totanus hypoleucos)—seen April 10th, C.A.S.

Woodcock (Scolopax rusticola)—seen March 17th; were also seen in April; probably bred near Marlborough.

Landrail (Crex pratensis)—seen April 25th, R.; egg May 14th, J.B.O., S.C.V.F.

Moorhen (Gallinula chloropus)—eggs April 4th, R.; 5 eggs April 6th, H.G.P.

Pintail Duck (Anas acuta)—shot at Mildenhall, February 26th, R.

Scaup Duck (Fuligula marila)—shot at Mildenhall, Feb. 15th, Rev. C. Soames.

Little Grebe (Podiceps minor)—egg April 22nd, W.C.
Little Gull (Larus minutus)—picked up dead on Rockley Downs, Feb. 14th.

Owing to the Easter holidays we have been unable to get as many notices as we could have wished. By the kind help of some of the Townspeople, however, our list is much more perfect than it would otherwise have been. There are three new species added to our list: viz., Lesser Spotted Woodpecker (*Picus minor*), Pintail Duck (*Anas acuta*), and Little Gull (*Larus minutus*). This latter bird is an extremely rare visitant of England, especially in the south. The Heron has never before appeared in our list, although it is found a short way off Marlborough.—With respect to this last bird Mr. Gauntlett writes: "The Herons breed within a mile of my house (Bloxham's Lodge, in Savernake Forest), about three or four nests every year. I have never allowed them to be disturbed, but it is strange they do not increase. The young ones are now (May 20th) just flown. Unfortunately two young ones were blown from the nest and died, although the old ones fed them on the ground for several days: but finding they could not get them to take wing, I much believe they neglected to feed them."

# BOTANICAL NOTICES.

THE subjoined list is by far the most perfect we have ever been able to draw up. In order to have a *complete* List of Plants hitherto detected in the neighbourhood of Marlborough, we have inserted the names of those upon which no observations have been recorded, and it will be seen, therefore, how very few have escaped observation this year.

The past season has been a very peculiar one; the great cold in January and February and the excessive drought later on in the year have told upon vegetation and the addition to our List of the *duration* of the time of flowering will well repay a careful perusal.

During January no fresh flowers appeared in bloom, the few that could be obtained (only about 11 in number) were those which had survived the cold of December.

During February but very few plants came into flower. Crocuses, Snowdrops and Aconites were in flower by the 11th, but only the latter in any quantity. Scarcely any *wild* flowers were in bloom.

During March a few more plants came into flower, but by the 31st there were far fewer flowers open than usual, and not a single species absolutely common. Crocuses and Snowdrops were still in flower on the 31st, and the buds of some trees were bursting, but nothing properly in leaf. Gooseberries and Honeysuckle in warm gardens were in leaf, and a single branch of Lilac opened its buds on the 4th, but the young leaves were speedily killed by the frost. The Laurustinus too appeared in flower on the 1st, but the flowers were afterwards also destroyed by the frost.

During April vegetation was still very backward; by the 14th (when the School broke up for the Easter Holidays) Gooseberries and Currants were in leaf, and also Larches in very warm spots. Peaches, Apricots and Pears against walls were in flower. The Horse-chesnut and Hawthorn were getting green, and the Lime and Lilac buds were bursting, every other tree appeared in its winter dress. During the rest of the month and for the first half of May we are indebted to F. E. Thompson, Esq., for the notices recorded.

During May a fair number of plants were in flower, but not so many as usual and it was not till the beginning of June that vegetation was as far advanced as in ordinary years. Towards the end of the month, however, the drought had told severely and the number of plants in flower had seriously fallen off by the end of July, as will appear from the Table.

This being the first time the School remained at Marlborough during July, we naturally expected to make great additions to our Lists, the drought, however, dried up all our marshy spots, and hence, though we have made several

additions, and have found that some plants, hitherto considered rare, are by no means uncommon, we have not made our list as long as we had hoped.

The Table of duration of flowering requires a large number of notices. It is impossible to enter the names of those who have aided in the work, as the names of "First Discoverers" are entered, and hence a very wrong impression may be formed of the help obtained from the School generally—especially when so many first notices have been obtained by Messrs. Sowerby and Thompson, to whom our thanks are especially due. It has been decided, therefore to include in the List of "First Discoverers" the names also of those who have assisted in the work. As this decision was only come to after the List was made up, it is possible some few names may have been omitted, if there are any so omitted we trust that our apologies for the omission will be accepted.

An asterisk has been prefixed to the names of *cultivated* species—"by" indicates that the specimen observed had apparently been in flower a day or two before being discovered—and a ? has been placed in the Table when the plant was *probably* in flower, though from various reasons no notice of its occurrence in that month was recorded.

Names of those whose initials occur in the following List, or who have otherwise aided in perfecting it.

| | |
|---|---|
| E.A. ... ... ... ... | E. Almack. |
| H.R.A. ... ... ... ... | H. R. Armstrong. |
| A.W.B. ... ... ... ... | A. W. Banks. |
| T.S.F.B. ... ... ... ... | T. S. F. Battersby. |
| H.B. ... ... ... ... | Rev. H. Bell. |
| R.H.B. ... ... ... ... | R. H. Bicknell. |
| C.V.B. ... ... ... ... | C. V. Boys. |
| M.B. ... ... ... ... | Miss Mabel Bradley. |
| C.L.G.B. ... ... ... ... | C. L. G. Broughton. |
| A.B. ... ... ... ... | A. Busk. |
| G.T.P.C. ... ... ... ... | G. T. P. Cambridge. |
| S.F.C. ... ... ... ... | S. F. Chichester. |
| D.C. ... ... ... ... | D. Coles. |
| J.M.L.D. ... ... ... | J. M. L. Davies. |
| G.W.D.L. ... ... ... | Rev. G. W. DeLisle. |
| R.E.D. ... ... ... ... | R. E. Dennett. |
| H.S.D. ... ... ... ... | H. S. Dickinson. |
| S.B.D. ... ... ... ... | S. B. Dixon, Esq. |
| J.W.D. ... ... ... ... | J. W. Dudding. |
| S.W.F. ... ... ... ... | S. W. Featherstone. |

| | |
|---|---|
| W.D.F. ... ... ... ... | W. D. Fenning. |
| S.C.V.F. ... ... ... ... | S. C. V. Filleul. |
| J.B.F. ... ... ... ... | J. B. Fuller. |
| J.H.G. ... ... ... .. | J. H. Garland. |
| A.A.G. ... ... ... ... | A. A. Gill. |
| J.B.G. ... ... ... ... | J. B. Gilmore, Esq. |
| H.C.G. ... ... ... ... | H. C. Glyn. |
| W.G. ... ... ... ... | W. Goodchild. |
| H.G. ... ... ... ... | H. Gordon. |
| J.W.G. ... ... ... ... | J. W. Griffith. |
| C.R.G. ... ... ... ... | C. R. Gunner. |
| E.L.H. ... ... ... ... | E. L. Hesketh. |
| P.L.H. ... ... ... ... | P. L. Hesketh. |
| H.B.H. ... ... ... ... | H. B. Horner, Esq. |
| F.E.H. ... ... ... .. | F. E. Hulme, Esq., F.L.S. |
| H.T.K. ... ... ... ... | H. T. King. |
| F.L. ... ... ... ... | F. Leigh. |
| E.W.M.L. ... ... ... | E. W. M. Lloyd, Esq. |
| N.L. ... ... ... ... | N. Loring. |
| D.C.W.L.... ... ... ... | D. C. W. Lysons. |
| W.H.M. ... ... ... ... | W. H. Macdonald, Esq. |
| C.G.H.M.... ... ... ... | C. G. H. Mann. |
| G.C.M. ... ... ... ... | G. C. Mansel. |
| W.M. ... ... ... ... | W. Mansell, Esq. |
| A.S.M. ... ... ... ... | A. S. Marshall-Hall. |
| G.E.M. ... ... ... ... | G. E. Mew. |
| A.L.N. ... ... ... ... | A. L. Napier. |
| G.N. ... ... ... ... | G. Nares. |
| W.M.N. ... ... ... ... | W. M. Norsworthy. |
| J.B.O. ... ... ... ... | J. B. Oakeley. |
| G.H.P. ... ... ... ... | G. H. Perry. |
| H.A.M.P.... ... ... ... | H. A. M. Power. |
| C.S. ... ... ... ... | C. Sankey, Esq. |
| G.J.S. ... ... ... ... | G. J. Scott. |
| C.A.S. ... ... ... ... | C. A. Sladen. |
| J.S. ... ... ... ... | Rev. J. Sowerby. |
| E.C.S. ... ... ... ... | E. C. Stanton. |
| E.W.S. ... ... ... ... | E. W. Swetenham. |
| C.W.T. ... ... ... ... | Rev. C. W. Tayler. |
| F.E.T. ... ... ... ... | F. E. Thompson, Esq. |
| C.E.T. ... ... ... ... | Rev. C. E. Thorpe. |

| | |
|---|---|
| T. ... ... ... ... | Tottenham. |
| S.F.T. ... ... ... ... | S. F. Townsend. |
| C.R.W. ... ... ... ... | C. R. Waldron. |
| H.H.W. ... ... ... ... | H. H. Ward. |
| W.H.K.W. ... ... ... | W. H. K. Ward. |
| T.F.W. ... ... ... ... | T. F. Wilson. |
| H.J.W. ... ... ... ... | H. J. Wood. |

## DICOTYLEDONS.

### THALAMIFLORÆ.

#### Ranunculaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Clematis** | | | | | | | | |
| Vitalba..... | — | — | — | — | — | — | j | by July 16, F.E.T. |
| **Thaliotrum** | | | | | | | | |
| flavum..... | — | — | — | — | — | j | j | June 10, F.E.T. |
| *aquilegifolium | — | — | — | — | m | j | — | May 29. |
| **Anemone** | | | | | | | | |
| nemorosa ..... | — | — | m | a | mm | — | — | Mar. 20, C.R.G. & W.D.F. |
| *hepatica ..... | — | — | m | a | — | — | — | March 1, G.W.D.L. |
| *sylvestris..... | — | — | — | — | m | j | — | by May 12. |
| **Adonis** | | | | | | | | |
| autumnalis..... | — | — | — | — | — | — | — | |
| **Myosurus** | | | | | | | | |
| minimus ..... | — | — | — | — | m | — | — | in seed June 6. |
| **Ranunculus** | | | | | | | | |
| trichophyllus ... | — | — | — | — | m | — | — | by May 27, J.S. |
| Drouetii..... | — | — | — | — | — | — | — | |
| heterophyllus... | — | — | — | a | mm | jj | j | April 17, F.E.T. |
| pseudo-fluitans | — | — | — | — | m | j | j | by May 28. |
| peltatus ..... | — | — | — | a | mm | j | j | April 25, F.E.T. |
| circinatus ..... | — | — | — | — | m | j | — | full fl. May 28, F.E.T. |
| hederaceus..... | — | — | — | — | m | ? | — | full fl. May 28, F.E.T. |
| sceleratus ..... | — | — | — | — | m | ? | — | by May 24, J.S. & F.E.T. |
| Flammula..... | — | — | — | — | m | j | j | May 30, F.E.T. |
| Ficaria ..... | — | — | m | aa | m | — | — | March 1, G.W.D.L. |
| auricomus ..... | — | — | — | a | m | — | — | April 10, F.E.T. |
| acris..... | — | — | — | a | mm | jj | j | April 14, F.E.T. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| repens ..... | — | — | — | a | mm | jj | j | April 20, F.E.T. |
| bulbosus ..... | — | — | — | a | mm | j | — | April 7, J.S. |
| parviflorus ..... | — | — | — | — | — | — | — | could not be found. |
| arvensis ..... | — | — | — | — | m | jj | j | May 20, J.S. |
| **Caltha** | | | | | | | | |
| palustris ..... | — | — | m | a | m | j | — | March 20, S.W.F. |
| **Trollius** | | | | | | | | |
| *europæus ..... | — | — | — | — | m | — | — | by May 12. |
| **Eranthys** | | | | | | | | |
| *hyemalis ..... | — | f | m | — | — | — | — | by Feb. 11. |
| **Helleborus** | | | | | | | | |
| viridis ..... | — | — | m | a | ? | — | — | March 12, F.E.T. |
| *fœtidus ..... | — | — | m | ? | — | — | — | about March 23, J.S. |
| **Aquilegia** | | | | | | | | |
| vulgaris ..... | — | — | — | — | m | j | — | May 15, G.W.D.L. |
| BERBERIDACEÆ. | | | | | | | | |
| **Berberis** | | | | | | | | |
| vulgaris ..... | — | — | — | — | m | ? | — | by May 22, J.S. |
| *fascicularis ..... | — | — | — | a | ? | — | — | April 12. |
| NYMPHÆACEÆ. | | | | | | | | |
| **Nuphar** | | | | | | | | |
| lutea ..... | — | — | — | — | — | j | j | June 17, J.S. |
| PAPAVERACEÆ. | | | | | | | | |
| **Papaver** | | | | | | | | |
| Argemone ..... | — | — | — | — | m | j | — | May 20, J.S. |
| Rhœas ..... | — | — | — | — | — | jj | j | June 5, F.E.T. |
| var. strigosum... | — | — | — | — | — | j | — | June 10, F.E.T. |
| dubium ..... | — | — | — | — | m | j | j | May 30, J.S. |
| Lecoqii ..... | — | — | — | — | — | j | — | June 21, F.E.T. |
| somniferum..... | — | — | — | — | — | j | — | June 28, F.E.T. |
| *orientale ..... | — | — | — | — | m | j | — | May 29. |
| **Meconopsis** | | | | | | | | |
| *cambrica..... | — | — | — | — | m | j | — | by May 29. |
| **Chelidonium** | | | | | | | | |
| majus ..... | — | — | — | a | m | jj | j | April 25, J.S |
| FUMARIACEÆ. | | | | | | | | |
| **Corydalis** | | | | | | | | |
| *solida ..... | — | — | m | a | — | — | — | March 25. |
| **Fumaria** | | | | | | | | |
| officinalis ..... | — | — | — | a | m | jj | j | April 16, F.E.T. |

CRUCIFERÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cheiranthus** | | | | | | | | |
| Cheiri ..... | — | — | — | ? | m | — | — | full fl. May 18, J.S. |
| **Nasturtium** | | | | | | | | |
| officinale ..... | — | — | — | — | m | jj | j | May 28, F.E.T. |
| sylvestre ..... | — | — | — | — | — | — | — | |
| palustre ..... | — | — | — | — | m | j | j | May 18, J.S. |
| **Barbarea** | | | | | | | | |
| vulgaris ..... | — | — | — | — | m | j | — | May 12, J.S. & F.E.T. |
| **Arabis** | | | | | | | | |
| hirsuta ..... | — | — | — | — | m | — | — | May 12, J.S. & F.E.T. |
| **Cardamine** | | | | | | | | |
| sylvatica..... | — | — | — | — | m | — | — | May 12, J.S. & F.E.T. |
| hirsuta ..... | — | — | m | a | m | — | — | by March 17, J.S. |
| pratensis..... | — | — | — | a | mm | j | — | April 14, F.E.T. |
| **Sisymbrium** | | | | | | | | |
| officinale ..... | — | — | — | — | m | j | j | May 12, J.S. & F.E.T. |
| thalianum ..... | — | — | — | — | m | — | — | seed May 22, J.S. |
| **Alliaria** | | | | | | | | |
| officinalis ..... | — | — | — | a | m | j | — | April 20, F.E.T. |
| **Erysimum** | | | | | | | | |
| cheiranthoides | — | — | — | — | — | j | j | June 21, F.E.T. |
| **Brassica** | | | | | | | | |
| *oleracea ..... | — | — | — | a | m | j | — | April 19, J.S. & F.E.T. |
| campestris ..... | — | — | — | a | m | j | j | April 19, J.S. & F.E.T. |
| Napus ..... | — | — | — | — | — | j | — | June 17, J.S. |
| **Lunaria** | | | | | | | | |
| *biennis ..... | — | — | — | — | m | j | — | by May 22, G.W.D.L. |
| **Sinapis** | | | | | | | | |
| nigra ..... | — | — | — | — | — | — | — | |
| arvensis ..... | — | — | — | — | m | jj | j | May 19, J.S. |
| alba ..... ..... | — | — | — | — | m | jj | j | May 31, D.C.W.L. |
| **Alyssum** | | | | | | | | |
| calycinum ..... | — | — | — | — | — | j | — | seed June 30, S.F.T. |
| incanum ..... | — | — | — | — | — | — | j | full fl. July 15, G.W.D.L. |
| **Aubrietia** | | | | | | | | |
| *purpurea. .... | — | — | m | a | m | — | — | by March 31, G.W.D.L. |
| **Draba** | | | | | | | | |
| verna ..... | — | — | m | a | mm | — | — | March 6, J.S. |
| **Armoracia** | | | | | | | | |
| rusticana..... | — | — | — | — | m | j | — | by May 26, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Thlaspi | | | | | | | | |
| arvense ..... | — | — | — | — | m | — | — | by May 27, J.S. |
| Lepidium | | | | | | | | |
| campestre ..... | — | — | — | — | m | — | — | May 16, F.E.T. |
| Capsella | | | | | | | | |
| Bursa-pastoris | h | h | h | a | mm | jj | j | March 29, J.S. (? hybernated specimen). |
| Senebiera | | | | | | | | |
| Coronopus ..... | — | — | — | — | — | j | j | June 21, F.E.T. |
| Isatis | | | | | | | | |
| *tinctoria ..... | — | — | — | — | m | — | — | May 15. |
| Raphanus | | | | | | | | |
| Raphanistrum ... | — | — | — | — | — | j | j | June 7, J.S. |
| RESEDACEÆ. | | | | | | | | |
| Reseda | | | | | | | | |
| lutea ..... | — | — | — | — | m | j | j | May 20, J.B.F. & E.L.H. |
| Luteola ..... | — | — | — | — | — | j | j | June 17, J.S. |
| CISTACEÆ. | | | | | | | | |
| Helianthemum | | | | | | | | |
| vulgare ..... | — | — | — | — | mm | jj | j | May 16, F.E.T. |
| VIOLACEÆ. | | | | | | | | |
| Viola | | | | | | | | |
| odorata ..... | — | f | m | aa | — | — | — | (cult.) Feb. 11, (wild) March 21, F.E.T. |
| var. alba ... ..... | — | — | m | aa | — | — | — | March 18, W.D F.& C.R.G. |
| var. rubra ..... | — | — | m | a | — | — | — | March 20, H.A.M.P. and T.S.F.B. |
| hirta ..... | — | — | m | a | — | — | — | March 25, F.E.T. |
| Reichenbachiana | — | — | — | a | m | — | — | April 12, F.E.T. |
| Riviniana ..... | — | — | — | a | mm | j | — | April 16, F.E.T. |
| canina ..... | — | — | — | — | m | — | — | May 13, F.E.T. |
| tricolor ..... | — | — | — | a | m | — | — | April 25, F.E.T. |
| var. arvensis ... | — | — | (m) | a | m | jj | j | March 25, J.S. (hybernated specimen). |
| POLYGALACEÆ. | | | | | | | | |
| Polygala | | | | | | | | |
| vulgaris ..... | — | — | — | a | mm | jj | j | April 25, F.E.T. |
| CARYOPHYLLACEÆ. | | | | | | | | |
| Dianthus | | | | | | | | |
| *deltoides ..... | — | — | — | — | — | j | — | June 4. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Saponaria | | | | | | | | |
| officinalis... ..... | — | — | — | — | — | — | — | in bud by the end of July |
| Silene | | | | | | | | |
| inflata ..... | — | — | — | — | m | jj | j | May 30, J.S. |
| Lychnis | | | | | | | | |
| Flos-cuculi ..... | — | — | — | — | m | jj | j | by May 28, J.S. & F.E.T. |
| vespertina ..... | — | — | — | — | m | jj | j | May 20, F.E.T. |
| diurna ..... | — | — | — | a | mm | j | j | April 21, F.E.T. |
| Githago ..... | — | — | — | — | — | j | j | June 15, F.E.T. |
| Sagina | | | | | | | | |
| procumbens ... | — | — | — | — | m | j | j | by May 27, H.T.K. |
| nodosa ..... | — | — | — | — | — | — | — | |
| Arenaria | | | | | | | | |
| trinervis .. ..... | — | — | — | a | mm | j | — | April 20th, F.E.T. |
| serpyllifolia ... | — | — | — | — | m | — | — | May 19, J.S. |
| leptoclados ..... | — | — | — | — | m | j | — | full fl. May 26, J.S. |
| Stellaria | | | | | | | | |
| media ..... | h | h | h | a | mm | j | j | all the year. |
| Holostea ..... | — | — | — | a | mm | jj | — | April 11, F.E.T. |
| graminea..... | — | — | — | — | m | j | j | May 30, J.S. & F.E.T. |
| uliginosa..... | — | — | — | — | m | j | j | May 28, F.E.T. |
| Malachium | | | | | | | | |
| aquaticum ..... | — | — | — | — | — | — | — | |
| Cerastium | | | | | | | | |
| glomeratum ... | — | — | — | a | m | (j) | — | April 26, F.E.T. |
| triviale ..... | — | — | (h) | a | mm | jj | j | April 1. |
| *arvense ..... | — | — | — | — | m | — | — | by May 12. |
| Mœnchia | | | | | | | | |
| erecta ..... | — | — | — | — | — | — | — | could not be found. |
| Spergula | | | | | | | | |
| arvensis ..... | — | — | — | — | m | j | j | May 27, J.S. |
| Scleranthus | | | | | | | | |
| annuus ..... | — | — | — | — | — | — | — | |
| MALVACEÆ. | | | | | | | | |
| Malva | | | | | | | | |
| moschata ..... | — | — | — | — | — | j | j | June 20, F.E.T. |
| sylvestris ..... | — | — | — | — | m | jj | j | May 27, C.E.T. |
| rotundifolia ... | — | — | — | — | m | j | j | May 30, F.E.T. |
| TILIACEÆ. | | | | | | | | |
| Tilia | | | | | | | | |
| *europæa..... | — | — | — | — | — | — | jj | July 3, over by July 20. |

HYPERICACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Hypericum** | | | | | | | | |
| *Androsæmum | — | — | — | — | — | — | j | July 6. |
| tetrapterum ... | — | — | — | — | — | j | j | June 20, F.E.T. |
| perforatum ..... | — | — | — | — | — | j | j | June 20, F.E.T. |
| humifusum..... | — | — | — | — | — | j | ? | June 17, J.S. |
| hirsutum..... | — | — | — | — | — | j | j | June 25, J.S. |
| pulchrum ..... | — | — | — | — | — | j | j | June 21, J.S. |

ACERACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Acer** | | | | | | | | |
| campestre ..... | — | — | — | — | m | j | — | May 12, J.S. & F.E.T. |
| Pseudo-platanus | — | — | — | — | m | j | — | May 12, J.S. & F.E.T. |

ÆSCULACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Æsculus** | | | | | | | | |
| Hippocastanum | — | — | — | — | m | j | — | May 12, J.S. & F.E.T. |

GERANIACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Geranium** | | | | | | | | |
| phæum ..... | — | — | — | — | m | j | — | May 12. |
| *sylvaticum ..... | — | — | — | — | m | j | — | May 20. |
| pratense ..... | — | — | — | — | m | jj | j | May 26, F.E.T. |
| *sanguineum ... | — | — | — | — | — | j | — | June 4. |
| *var. lancastriense | — | — | — | — | m | j | — | May 31. |
| molle ..... | — | — | — | a | mm | j | j | April 26, F.E.T. |
| rotundifolium... | — | — | — | — | m | j | — | May 16. |
| dissectum ..... | — | — | — | — | m | j | j | May 14, J.S. & F.E.T. |
| columbinum ... | — | — | — | — | m | j | — | May 3, J.S. |
| lucidum ..... | — | — | — | a | mm | j | j | April 27, J.S. |
| robertianum ... | — | — | — | a | mm | jj | j | April 28, F.E.T. |
| *macrorrhizon | — | — | — | — | m | j | — | by May 29. |
| **Erodium** | | | | | | | | |
| cicutarium ..... | — | — | — | — | — | — | — | |

OXALIDACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Oxalis** | | | | | | | | |
| Acetosella ..... | — | — | — | a | m | — | — | April 19, J.S. and F.E.T |
| corniculata ..... | — | — | — | — | — | — | — | |

LINACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Linum** | | | | | | | | |
| usitatissimum... | — | — | — | — | — | — | j | July 9, Mrs. Thompson. |
| catharticum ... | — | — | — | — | m | jj | j | May 20, J.S. |

## CALYCIFLORÆ.

### CELASTRACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Staphylea** | | | | | | | | |
| *pinnata ..... | — | — | — | — | m | — | — | by May 12. |
| **Euonymus** | | | | | | | | |
| europeus..... | — | — | — | — | m | j | — | May 27, G.W.D.L. |

### RHAMNACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Rhamnus** | | | | | | | | |
| catharticus ..... | — | — | — | — | m | j | — | May 28, F.E.T. |

### LEGUMINOSÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Ulex** | | | | | | | | |
| europeus..... | h | h | h | a | mm | j | j | all the year. |
| nanus ..... ..... | — | — | — | — | — | — | — | |
| **Genista** | | | | | | | | |
| tinctoria ..... | — | — | — | — | — | jj | j | full fl. June 12, J.S. |
| anglica ..... | — | — | — | — | — | — | — | |
| **Sarothamnus** | | | | | | | | |
| scoparius ..... | — | — | — | a | m | j | — | April 19, J.S. and F.E.T. |
| **Ononis** | | | | | | | | |
| arvensis ..... | — | — | — | — | — | jj | j | June 16, J.B.F. & G.H.P. |
| campestris ..... | — | — | — | — | — | — | j | July 8, J.S. |
| **Medicago** | | | | | | | | |
| sativa ..... | — | — | — | — | — | j | j | June 30, S.F.T. |
| lupulina ..... | — | — | — | a | mm | jj | j | April 18, J.S. |
| **Melilotus** | | | | | | | | |
| officinalis..... | — | — | — | — | — | — | — | |
| **Trifolium** | | | | | | | | |
| pratense ..... | — | — | — | — | mm | jj | j | May 12, J.S. and F.E.T. |
| *incarnatum ... | — | — | — | — | mm | j | j | May 18, J.S. |
| arvense ..... | — | — | — | — | — | — | — | |
| repens ..... | — | — | — | — | m | jj | j | May 18, J.S. |
| hybridum ..... | — | — | — | — | — | j | — | June 6. |
| *fragiferum..... | — | — | — | — | — | — | — | |
| procumbens ... | — | — | — | — | — | jj | j | June 7, J.S. |
| minus ..... | — | — | — | — | m | j | j | May 14, F.E.T. |
| **Lotus** | | | | | | | | |
| corniculatus ... | — | — | — | — | mm | jj | j | May 12, J.S. and F.E.T. |
| major ..... | — | — | — | — | — | j | j | June 28, F.E.T. |
| **Anthyllis** | | | | | | | | |
| vulneraria ..... | — | — | — | — | m | jj | j | May 20, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Astragalus** | | | | | | | | |
| glycyphyllos ... | — | — | — | — | — | — | — | |
| **Vicia** | | | | | | | | |
| hirsuta..... | — | — | — | — | m | j | j | May 18, J.S. and F.E.T. |
| tetrasperma ... | — | — | — | — | ? | j | — | by June 3, J.S. |
| gracilis ..... | — | — | — | m | ? | — | — | by May 27, J.S. |
| sylvatica..... | — | — | — | — | — | j | — | full fl. June 14, J.B.F. & G.H.P. |
| Cracca ..... | — | — | — | — | — | jj | j | June 11, F.E.T. |
| sepium..... | — | — | — | a | mm | jj | j | April 21, F.E.T. |
| sativa ..... | — | — | — | a | m | jj | j | April 23, F.E.T. |
| (var) angustifolia | — | — | — | — | — | — | — | |
| **Lathyrus** | | | | | | | | |
| Aphaca ..... | — | — | — | — | — | j | j | June 17, J.S. |
| Nissolia ..... | — | — | — | — | — | — | — | |
| pratensis..... | — | — | — | — | m | jj | j | May 21, F.E.T. |
| macrorrhizus ... | — | — | — | a | m | j | — | April 16, F.E.T. |
| **Orobus** | | | | | | | | |
| *vernus..... | — | — | — | a | — | — | — | April 10. |
| **Hippocrepis** | | | | | | | | |
| comosa ..... | — | — | — | — | m | j | j | May 23, F.E.T. |
| **Onobrychis** | | | | | | | | |
| sativa ..... | — | — | — | — | m | j | j | May 12, J.S. |
| **Cytisus** | | | | | | | | |
| *Laburnum ..... | — | — | — | — | m | — | — | May 18. |
| ROSACEÆ. | | | | | | | | |
| **Prunus** | | | | | | | | |
| communis | | | | | | | | |
| var. spinosa ... | — | — | — | a | ? | — | — | April 16, F.E.T. |
| var. insititia ... | — | — | — | a | ? | — | — | April 13, F.E.T. |
| var. domestica | — | — | — | a | ? | — | — | April 22, F.E.T. |
| *Padus ..... | — | — | — | — | m | — | — | full fl. May 16. |
| Avium ..... | — | — | — | a | ? | — | — | April 25, F.E.T. |
| cerasus ..... | — | — | — | *a | — | — | — | cult. April 12, G.W.D.L. |
| **Spiræa** | | | | | | | | |
| Ulmaria ..... | — | — | — | — | — | j | j | June 11, J.S. |
| Filipendula ... | — | — | — | — | — | j | j | full fl. June 26, J.S. |
| **Sanguisorba** | | | | | | | | |
| officinalis ..... | — | — | — | — | — | — | — | |
| **Poterium** | | | | | | | | |
| sanguisorba ... | — | — | — | — | — | jj | j | May 12, J.S. and F.E.T. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Agrimonia** | | | | | | | | |
| **Eupatoria** ..... | — | — | — | — | — | jj | j | June 11, J.B.G. |
| **odorata** ..... | — | — | — | — | — | — | — | |
| **Alchemilla** | | | | | | | | |
| **vulgaris** ..... | — | — | — | — | m | j | — | May 12, F.E.T. |
| **arvensis** ..... ... | — | — | (m) | — | m | — | — | March 24, May 14. |
| **Sibbaldia** | | | | | | | | |
| ***procumbens** ... | — | — | — | — | m | — | — | full fl. May 12. |
| **Potentilla** | | | | | | | | |
| **anserina** ..... | — | — | — | — | m | jj | j | May 12, J.S. & F.E.T. |
| **reptans** ..... | — | — | — | — | — | jj | j | June 8, A.B. |
| **Tormentilla** ... | — | — | — | — | m | j | j | May 15, F.E.T. |
| **fragariastrum**... | — | — | m | aa | m | — | — | March 16, F.E.T. |
| **Fragaria** | | | | | | | | |
| **vesca** ..... | — | — | (m) | — | m | j | j | March 29, J.S.; May 12, J.S. & F.E.T. |
| **elatior** ..... | — | — | — | — | — | — | — | |
| **Rubus** | | | | | | | | |
| **Idæus** ..... | — | — | — | — | m | j | — | May 27, J.S. |
| **rhamnifolius** ... | — | — | — | — | — | — | — | |
| **discolor** ..... | — | — | — | — | — | j | j | June 20, F.E.T. |
| **leucostachys** ... | — | — | — | — | — | — | — | |
| **Radula**..... | — | — | — | — | — | j | ? | by June 24. |
| **corylifolius** ..... | — | — | — | — | — | j | — | June 11, J.S. |
| **tuberculatus** ... | — | — | — | — | — | — | — | |
| **cæsius** ..... | — | — | — | — | m | jj | j | May 21, F.E.T. |
| **Geum** | | | | | | | | |
| **urbanum** ..... | — | — | — | — | m | jj | j | May 12, F.E.T. |
| **intermedium** ... | — | — | — | — | — | — | — | |
| **rivale** ..... | — | — | — | — | m | j | — | May 18, J.S. |
| ***coccineum** ... | — | — | — | — | — | j | — | June 4. |
| **Rosa** | | | | | | | | |
| **tomentosa** ..... | — | — | — | — | — | j | j | June 11, J.S. |
| **rubiginosa** ..... | — | — | — | — | — | — | — | |
| **canina** ..... | — | — | — | — | m | jj | j | May 30, A.W.B., over July 15. |
| **arvensis** ..... | — | — | — | — | — | j | j | June 14, J.S. |
| **Crataegus** | | | | | | | | |
| **Oxyacantha** ... | — | — | — | — | mm | j | — | May 14, J.S. & F.E.T., over June 14. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Pyrus** | | | | | | | | |
| Malus ..... | — | — | — | — | m | ? | — | full fl. May 19, J.S. |
| var. acerba ..... | — | — | — | — | m | ? | — | full fl. May 21, J.S. |
| var. mitis ..... | — | — | — | — | m | ? | — | full fl. May 21, F.E.T. |
| *Aucuparia ... | — | — | — | — | m | ? | — | May 21, F.E.T. |
| Aria ..... | — | — | — | — | — | — | — | |
| *Japonica ..... | — | — | m | ? | — | — | — | by March 17. |
| *apricot ..... | — | — | m | ? | — | — | — | March 23, G.W.D.L. |
| *apple ..... | | | | | | | | |
| *pear ..... | | | | | | | | |
| *plum ..... | | | | | | | | |
| **Kerria** | | | | | | | | |
| *Japonica ..... | — | — | — | a | ? | — | — | April 11. |
| LYTHRACEÆ. | | | | | | | | |
| **Lythrum** | | | | | | | | |
| Salicaria ..... | — | — | — | — | — | — | — | |
| **Peplis** | | | | | | | | |
| Portula ..... | — | — | — | — | — | — | — | |
| ONAGRACEÆ. | | | | | | | | |
| **Epilobium** | | | | | | | | |
| angustifolium... | — | — | — | — | — | — | j | July 4, F.E.T. |
| hirsutum ..... | — | — | — | — | — | — | j | July 2, J.S. |
| parviflorum..... | — | — | — | — | — | j | j | June 7, J.S. & F.E.T. |
| montanum ..... | — | — | — | — | — | j | j | June 4. |
| palustre .. ..... | — | — | — | — | — | — | j | July 2, J.S. |
| **Circæa** | | | | | | | | |
| lutetiana ..... | — | — | — | — | — | j | j | full bud June 20, H.H.W. |
| HALORAGACEÆ. | | | | | | | | |
| **Myriophyllum** | | | | | | | | |
| spicatum ..... | — | — | — | — | — | j | — | June 6, J.S. |
| CUCURBITACEÆ. | | | | | | | | |
| **Bryonia** | | | | | | | | |
| dioica ..... | — | — | — | — | m | j | j | May 23, F.E.T. |
| PORTULACEÆ. | | | | | | | | |
| **Montia** | | | | | | | | |
| fontana ..... | — | — | — | — | — | — | — | |
| CRASSULACEÆ. | | | | | | | | |
| **Sedum** | | | | | | | | |
| *Rhodiola ..... | — | — | — | — | m | — | — | full fl. May 12. |
| Fabaria ..... | — | — | — | — | — | — | — | not in fl. by end of July. |
| album ..... | — | — | — | — | — | — | — | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| acre ..... | — | — | — | — | — | j | j | June 6, J.S. |
| reflexum ..... | — | — | — | — | — | — | j | July 3, J.S. |
| Sempervivum | | | | | | | | |
| *tectorum ..... | — | — | — | — | — | — | j | July 15, F.E.T. |
| RIBESIACEÆ. | | | | | | | | |
| Ribes | | | | | | | | |
| *Grossularia ... | — | — | — | a | — | — | — | April 4, F.E.T. |
| *nigrum ..... | — | — | — | — | m | — | — | full fl. May 18, J.S. |
| *rubrum ..... .. | — | — | — | a | — | — | — | April 17, F.E.T. |
| *sanguineum ... | — | — | — | a | — | — | — | April 10, G.W.D.L. |
| *aureum ..... | — | — | — | a | ? | — | — | April 18. |
| SAXIFRAGACEÆ. | | | | | | | | |
| Saxifraga | | | | | | | | |
| *umbrosa ..... | — | — | — | — | m | j | — | May 20. |
| *hirsuta ..... | — | — | — | — | m | j | — | by May 21. |
| *cæspitosa ..... | — | — | — | — | m | j | — | May 20. |
| tridactylites ... | — | — | — | a | m | — | — | April 17, F.E.T. |
| granulata ..... | — | — | — | a | m | j | — | April 27, J.S. |
| *crassifolia..... | — | — | — | a | m | — | — | April 6. |
| *Kamschatica... | — | — | — | — | — | — | j | about July 15. |
| *incrustata..... | — | — | — | — | m | j | — | May 15. |
| Chrysosplenium | | | | | | | | |
| oppositifolium... | — | — | — | — | m | j | — | full fl. May 21, F.E.T. |
| Philadelphus | | | | | | | | |
| *coronarius ... | — | — | — | — | — | j | — | June 7. |
| UMBELLIFERÆ. | | | | | | | | |
| Sanicula | | | | | | | | |
| europæa ..... | — | — | — | — | m | j | j | May 18, J.S. |
| Apium | | | | | | | | |
| graveolens ..... | — | — | — | — | — | j | ? | bud June 10, J.S. |
| Helosciadium | | | | | | | | |
| nodiflorum ..... | — | — | — | — | — | j | ? | June 28, G.W.D.L. |
| inundatum ..... | — | — | — | — | — | j | — | fl. and seed June 17, J.S. |
| Sison | | | | | | | | |
| Amomum..... | — | — | — | — | — | — | j | July 24, J.S. |
| Ægopodium | | | | | | | | |
| Podagraria ..... | — | — | — | — | m | j | j | May 27, J.S. |
| Bunium | | | | | | | | |
| flexuosum ..... | — | — | — | -- | mm | jj | — | May 18, F.E.T. |
| Pimpinella | | | | | | | | |
| saxifraga..... | — | — | — | (a) | m | j | j | April 17, F.E.T. May 16. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sium | | | | | | | | | |
| angustifolium ... | — | — | — | — | — | j | | | June 28, F.E.T. |
| Œnanthe | | | | | | | | | |
| crocata ..... | — | — | — | — | — | j | j | | June 6, F.E.T. |
| fluviatilis..... | — | — | — | — | — | — | j | | July 7, J.S. and F.E.T. |
| Æthusa | | | | | | | | | |
| Cynapium ..... | — | — | — | — | — | j | j | | June 11, J.S. |
| Fœniculum | | | | | | | | | |
| *officinale ..... | — | — | — | — | — | — | j | | full bud, July 15. |
| Haloscias | | | | | | | | | |
| *scoticum ..... | — | — | — | — | — | — | — | | |
| Silaus | | | | | | | | | |
| pratensis ..... | — | — | — | — | — | j | j | | June 21, F.E.T. |
| Angelica | | | | | | | | | |
| sylvestris..... | — | — | — | — | — | — | | | not in fl. by the end of July |
| Pastinaca | | | | | | | | | |
| sativa ... . ..... | — | — | — | (a) | m | j | j | | April 19, J.S. & F.E.T. May 26. |
| Heracleum | | | | | | | | | |
| Sphondylium ... | — | — | — | — | m | jj | j | | May 16, F.E.T. |
| Daucus | | | | | | | | | |
| Carota ..... | — | — | — | — | — | j | j | | June 11, F.E.T. |
| Torilis | | | | | | | | | |
| Anthriscus ..... | — | — | — | — | — | j | j | | June 21, J.S. |
| infesta ..... | — | — | — | — | — | j | j | | June 21, J.S. |
| nodosa ..... | — | — | — | — | — | — | — | | |
| Scandix | | | | | | | | | |
| Pecten-Veneris | — | — | — | (a) | m | j | j | | April 28, J.S. (Figheldean), May 12. |
| Anthriscus | | | | | | | | | |
| sylvestris..... .. | — | — | m | aa | mm | j | j | | March 21, F.E.T. |
| Chærophyllum | | | | | | | | | |
| temulum..... | — | — | — | — | m | jj | j | | May 24, (Bicknoll); May 28. |
| Conium | | | | | | | | | |
| maculatum ..... | — | — | — | — | — | — | — | | |
| HEDERACEÆ. | | | | | | | | | |
| Hedera | | | | | | | | | |
| Helix ..... | — | — | — | — | — | — | — | | |
| CORNACEÆ. | | | | | | | | | |
| Cornus | | | | | | | | | |
| sanguinea ..... | — | — | — | — | — | jj | — | | June 5, G.W.D.L. over by June 30. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *mascula..... | — | — | m | a | — | — | — | March 6. |

## COROLLIFLORÆ.

### Caprifoliaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Adoxa** | | | | | | | | |
| Moschatellina... | — | — | m | a | m | — | — | March 21, F.E.T. |
| **Sambucus** | | | | | | | | |
| nigra ..... | — | — | — | — | m | jj | j | May 23, F.E.T. |
| **Viburnum** | | | | | | | | |
| Lantana ..... | — | — | — | — | mm | j | — | May 12. |
| Opulus..... | — | — | — | — | m | j | — | (barren) May 20, J.S., (fertile) May 29, H.G. and J.M.L.D. |
| *Laurustinus ... | — | — | m | a | m | ? | — | March 1, G.W.D.L. |
| **Lonicera** | | | | | | | | |
| *Caprifolium ... | — | — | — | — | — | — | — | |
| Periclymenum | — | — | — | — | — | jj | j | June 6, F.E.T. |
| **Symphoricarpos** | | | | | | | | |
| *racemosus..... | — | — | — | — | — | j | j | June 10, F.E.T. |

### Rubiaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sherardia** | | | | | | | | |
| arvensis ..... | — | — | — | a | m | j | — | April 28, F.E.T. |
| **Asperula** | | | | | | | | |
| cynanchica..... | — | — | — | — | — | jj | j | June 6, J.S. |
| odorata ..... | — | — | — | — | mm | j | — | May 12, J.S. |
| **Galium** | | | | | | | | |
| cruciatum ..... | — | — | — | a | m | j | — | April 18, F.E.T. |
| Aparine ..... | — | — | — | a | mm | jj | j | April 28, F.E.T. |
| Mollugo ..... | — | — | — | — | mm | jj | j | May 28, F.E.T. |
| verum ..... | — | — | — | — | — | j | jj | June 17, F.E.T. |
| saxatile ..... | — | — | — | — | — | j | — | June 11, J.S. |
| uliginosum ..... | — | — | — | — | — | — | — | |
| palustre ..... | — | — | — | — | — | jj | j | June 10, F.E.T. |
| var. Witheringii | — | — | — | — | — | | | |

### Valerianaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Valeriana** | | | | | | | | |
| officinalis..... | — | — | — | — | — | j | j | June 12, J.W.G. |
| dioica ..... .. | — | — | — | — | m | j | — | May 12. |
| **Valerianella** | | | | | | | | |
| olitoria ..... | — | — | — | a | m | j | — | April 17, F.E.T. |
| dentata ..... | — | — | — | — | — | j | — | June 12, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Dipsaceæ.** | | | | | | | | |
| Dipsacus | | | | | | | | |
| sylvestris ..... | — | — | — | — | — | — | — | young bud June 21, F.E.T. |
| pilosus ..... | — | — | — | — | — | — | — | |
| Knautia | | | | | | | | |
| arvensis ..... | — | — | — | — | m | jj | j | May 28, F.E.T. |
| Scabiosa | | | | | | | | |
| succisa..... | — | — | — | — | — | — | — | not in fl. by July 27. |
| columbaria ..... | — | — | — | — | — | j | j | June 12, J.W.G. |
| **Compositæ.** | | | | | | | | |
| Eupatorium | | | | | | | | |
| cannabinum ... | — | — | — | — | — | — | j | July 9, G.W.D.L. |
| Petasites | | | | | | | | |
| vulgaris ..... | — | — | m | a | m | — | — | by March 12, F.E.T., J.S. |
| Tussilago | | | | | | | | |
| Farfara ..... | — | — | m | a | m | — | — | March 9, G.W.D.L. |
| Erigeron | | | | | | | | |
| acris..... | — | — | — | — | m | j | j | May 21, F.E.T. |
| Bellis | | | | | | | | |
| perennis ..... | h | h | h | a | m | jj | j | all the year. |
| Solidago | | | | | | | | |
| Virgaurea ..... | — | — | — | — | — | — | — | |
| Inula | | | | | | | | |
| *Helenium ..... | — | — | — | — | — | j | j | |
| Conyza ..... | — | — | — | — | — | — | — | |
| Pulicaria | | | | | | | | |
| dysenterica ... | — | — | — | — | — | — | — | not by July 27; bud July 7. |
| Bidens | | | | | | | | |
| tripartita..... | — | — | — | — | — | — | — | not by July 27. |
| cernua ..... .. | — | — | — | — | — | — | — | ditto |
| Achillea | | | | | | | | |
| Ptarmica..... | — | — | — | — | — | — | — | ditto |
| *tomentosa ... | — | — | — | — | m | j | j | May 29. |
| Millefolium..... | — | — | — | — | m | jj | j | May 21, F.E.T. |
| Anthemis | | | | | | | | |
| arvensis ..... | — | — | — | — | — | j | j | full bud May 20, J.S. |
| Cotula ..... | — | — | — | — | — | j | — | June 6, FET. |
| nobilis ..... | — | — | — | — | — | j | — | June 14. |
| Matricaria | | | | | | | | |
| Parthenium ... | — | — | — | — | — | j | — | June 15, F.E.T. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| inodora ..... | — | — | — | a | m | j | j | April 27, J.S.; May 23, F.E.T. |
| Chamomilla ... | — | — | — | — | — | j | j | June 8, G.J.S. |
| Chrysanthemum | | | | | | | | |
| Leucanthemum | — | — | — | — | m | jj | j | May 16, F.E.T. |
| segetum ..... | — | — | — | — | — | j | j | June 9, F.E.T. |
| Artemisia | | | | | | | | |
| *Absinthium ... | — | — | — | — | — | — | j | |
| vulgaris ..... | — | — | — | — | — | — | j | July 18, G.W.D.L. |
| Tanacetum | | | | | | | | |
| vulgare ..... | — | — | — | — | — | — | — | |
| Filago | | | | | | | | |
| germanica ..... | — | — | — | — | — | j | j | June 24, J.S. |
| minima ..... | — | — | — | — | — | — | — | |
| Gnaphalium | | | | | | | | |
| uliginosum ..... | — | — | — | — | — | — | j | July 8, J.S. |
| sylvaticum ..... | — | — | — | — | — | — | — | not in fl. by July 27. |
| Doronicum | | | | | | | | |
| *Pardalianches | — | — | — | — | m | — | — | May 15. |
| Senecio | | | | | | | | |
| vulgaris ..... | h | h | h | a | m | jj | j | all the year. |
| erucifolius ..... | — | — | — | — | — | — | — | bud July 7, F.E.T. |
| Jacobæa ..... | — | — | — | — | m | jj | j | May 28, F.E.T. |
| aquaticus ..... | — | — | — | — | — | j | j | June 6, J.S. |
| campestris ..... | — | — | — | — | m | ? | — | May 20, J.S. |
| Carlina | | | | | | | | |
| vulgaris ... ..... | — | — | — | — | — | — | j | July 15, J.S. & G.W.D.L. |
| Arctium | | | | | | | | |
| majus ..... | — | — | — | — | — | — | j | July 15, J.S. |
| nemorosum ... | — | — | — | — | — | — | j | July 9, J.S. |
| intermedium ... | — | — | — | — | — | — | — | |
| Serratula | | | | | | | | |
| tinctoria ..... | — | — | — | — | — | j | — | June 26, R.E.D. |
| Centaurea | | | | | | | | |
| nigra ..... | — | — | — | — | — | jj | j | June 11, F.E.T. |
| Cyanus ..... | — | — | — | — | — | j | j | June 9, F.E.T. |
| Scabiosa ..... | — | — | — | — | — | jj | j | June 9, F.E.T. |
| Onopordum | | | | | | | | |
| Acanthium ..... | — | — | — | — | — | — | — | |
| Carduus | | | | | | | | |
| nutans..... | — | — | — | — | — | jj | j | June 12, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| crispus ..... | — | — | — | — | m | jj | j | May 15, P.L.H. |
| lanceolatus ..... | — | — | — | — | — | — | j | July 1, J.S.; G.W.D.L. |
| eriophorus ..... | — | — | — | — | — | — | j | July 23, J.S. |
| arvensis ..... | — | — | — | — | — | j | j | June 23. |
| palustris ..... | — | — | — | — | m | jj | j | May 22, F.E.T. |
| pratensis ..... | — | — | — | — | — | — | — | |
| tuberosus ..... | — | — | — | — | — | — | — | |
| acaulis ..... | — | — | — | — | — | j | j | about June 14, G.W.D.L. |
| Silybum | | | | | | | | |
| *marianum ... | — | — | — | — | — | j | ? | June 16. |
| Lapsana | | | | | | | | |
| communis ..... | — | — | — | — | — | jj | j | June 11, J.S. |
| Cicherium | | | | | | | | |
| Intybus ..... | — | — | — | — | — | — | — | |
| Hypochoeris | | | | | | | | |
| radicata ..... | — | — | — | — | m | jj | j | May 18, J.S. |
| Apargia | | | | | | | | |
| hispida ..... | — | — | — | — | m | jj | j | May 18, J.S. |
| autumnalis ..... | — | — | — | — | — | j | j | June 6. |
| Tragopogon | | | | | | | | |
| minor ..... | — | — | — | — | m | j | j | May 28, F.E.T. |
| Picris | | | | | | | | |
| hieraciordes ... | — | — | — | — | — | — | j | July 15, G.W.D.L. |
| Helminthia | | | | | | | | |
| echiordes.. ..... | — | — | — | — | — | — | — | |
| Leontodon | | | | | | | | |
| Taraxacum ..... | h | h | h | aa | mm | jj | j | All the year |
| Sonchus | | | | | | | | |
| oleraceus ..... | — | — | — | — | — | j | — | June 15, F.E.T. |
| asper ..... | — | — | — | — | — | jj | j | June 5, J.S. |
| arvensis ..... | — | — | — | — | — | j | — | bud June 17, J.S. |
| Mulgedium | | | | | | | | |
| *alpinum..... | — | — | — | — | — | j | — | June 19 |
| Crepis | | | | | | | | |
| virens ..... | — | — | — | — | m | jj | j | May 12, J.S. |
| biennis ..... | — | — | — | — | — | — | — | |
| Hieracium | | | | | | | | |
| Pilosella ..... | — | — | — | — | m | jj | j | May 16, F.E.T. |
| *aurantiacum ... | — | — | — | ... | — | j | — | June 5 |
| murorum ..... | — | — | — | — | — | — | — | |
| vulgatum ..... | — | — | — | — | — | j | j | June 20, F.E.T. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| borcale ..... | — | — | — | — | — | — | — | |
| CAMPANULACEÆ. | | | | | | | | |
| Jasione | | | | | | | | |
| montana ..... | — | — | — | — | — | — | — | |
| Phyteuma ..... | | | | | | | | |
| orbiculare ..... | — | — | — | — | — | — | — | |
| Campanula | | | | | | | | |
| glomerata ..... | — | — | — | — | — | j | j | June 14, M.B. |
| *latifolia ..... | — | — | — | — | m | j | — | |
| Trachelium ..... | — | — | — | — | — | — | j | by July 10, J.S. |
| rotundifolia ... | — | — | — | — | — | j | j | June 18, J.S. |
| Specularia | | | | | | | | |
| hybrida ..... | — | — | — | — | m | ? | — | by May 27, J.S. |
| ERICACEÆ: | | | | | | | | |
| Calluna | | | | | | | | |
| vulgaris ..... | — | — | — | — | — | — | — | |
| Monotropa | | | | | | | | |
| Hypopitis ..... | — | — | — | — | — | — | — | |
| AQUIFOLIACEÆ. | | | | | | | | |
| Ilex | | | | | | | | |
| Aquifolium ..... | — | — | — | — | m | j | — | May 18, F.E.T. |
| JASMINACEÆ. | | | | | | | | |
| Ligustrum | | | | | | | | |
| vulgare ..... | — | — | — | — | — | j | j | June 12, T.F.W. |
| Fraxinus | | | | | | | | |
| excelsior ..... | — | — | — | a | — | — | — | April 10, C.A.S. (Alton); April 18. F.E.T. |
| Syringa | | | | | | | | |
| *vulgaris ..... | — | — | — | — | m | j | — | |
| APOCYNACEÆ. | | | | | | | | |
| Vinca | | | | | | | | |
| minor ..... | — | — | m | a | m | — | — | March 10, F.E.T. |
| major ..... | — | — | — | a | m | — | — | *April 8; (wild) April 25, F.E.T. |
| GENTIANACEÆ. | | | | | | | | |
| Erythræa | | | | | | | | |
| Centaurium..... | — | — | — | — | — | j | j | June 20, F.E.T. |
| Gentiana | | | | | | | | |
| Amarella..... | — | — | — | — | — | — | — | |
| campestris ..... | — | — | — | — | — | — | — | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Menyanthes | | | | | | | | | |
| trifoliata ..... | — | — | — | — | a | m | j | April 26, F.E.T. |
| POLEMONIACEÆ. | | | | | | | | | |
| Polemonium | | | | | | | | | |
| cæruleum ..... | — | — | — | — | — | j | j | June 13, F.E.T. |
| CONVOLVULACEÆ. | | | | | | | | | |
| Convolvulus | | | | | | | | | |
| arvensis ..... | — | — | — | — | — | jj | j | June 3, G.J.S. |
| sepium..... | — | — | — | — | — | j | j | June 21 |
| Cuscuta | | | | | | | | | |
| Trifolii..... | — | — | — | ... | — | — | j | bud June 25. S.C.V.F. |
| BORAGINACEÆ. | | | | | | | | | |
| Cynoglossum | | | | | | | | | |
| officinale ..... | — | — | — | — | — | m | j | May 24, G.W.D.L. |
| Borago | | | | | | | | | |
| *officinalis ..... | — | — | — | — | — | — | j | | |
| Lycopsis | | | | | | | | | |
| arvensis ..... | — | — | — | — | — | j | j | June 6, J.S. | |
| Symphytum | | | | | | | | | |
| officinale..... | — | — | — | a | mm | jj | j | April 21, F.E.T. | |
| asperrimum .. | — | — | — | — | — | j | — | June 5, H.J.W | |
| Echium | | | | | | | | | |
| vulgare ..... | — | — | — | — | — | j | j | full fl. June 20, F.E.T. | |
| Pulmonaria | | | | | | | | | |
| *officinalis ..... | — | — | — | a | m | — | — | April 1 | |
| Lithospermum | | | | | | | | | |
| officinale..... | — | — | — | — | m | j | — | May 23, G.W.D.L. | |
| arvense ..... | — | — | — | — | m | j | j | May 20, J.S. | |
| Myosotis | | | | | | | | | |
| palustris..... | — | — | — | — | m | jj | j | May 21, F.E.T. | |
| arvensis ..... | — | — | — | a | m | jj | j | April 26, F.E.T. | |
| collina..... | — | — | — | a | m | j | — | April 19, J.S. & F.E.T. | |
| versicolor ... .. | — | — | — | — | m | j | — | by May 18, J.S. | |
| SOLANACEÆ. | | | | | | | | | |
| Solanum | | | | | | | | | |
| Dulcamara ..... | — | — | — | — | m | jj | j | May 30, J.S. | |
| *tuberosum ..... | — | — | — | — | — | j | j | June 9, F.E.T. | |
| Atropa | | | | | | | | | |
| *Belladonna..... | — | — | — | — | m | j | — | May 29 | |
| Hyoscyamus | | | | | | | | | |
| niger ..... | — | — | — | — | — | — | — | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lycium | | | | | | | | |
| *barbarum ..... | — | — | — | — | m | j | j | May 12, J.S. |
| OROBANCHACEÆ. | | | | | | | | |
| Orobanche | | | | | | | | |
| elatior..... | — | — | — | — | — | j | j | June 28, G.W.D.L. |
| minor ..... | — | — | — | — | — | j | j | June 10, J.S. |
| Lathræa | | | | | | | | |
| squamaria ..... | — | — | — | a | ? | — | — | April 26, F.E.T. |
| SCROPHULARIACEÆ. | | | | | | | | |
| Verbascum | | | | | | | | |
| Thapsus ..... | — | — | — | — | — | j | j | June 19, J.S. |
| nigrum ..... | — | — | — | — | — | — | j | July 3, J.S. |
| Digitalis | | | | | | | | |
| *purpurea ..... | — | — | — | — | — | j | — | |
| Antirrhinum | | | | | | | | |
| *majus ..... | — | — | — | — | — | — | — | |
| Linaria | | | | | | | | |
| Cymbalaria..... | — | — | — | a | m | j | ? | April 26, F.E.T. |
| spuria ..... | — | — | — | — | — | — | — | |
| minor ..... | — | — | — | — | m | j | j | May 30, W.M. |
| vulgaris ..... | — | — | — | — | — | j | j | June 11, J.S. |
| Scrophularia | | | | | | | | |
| nodosa..... | — | — | — | — | m | j | j | May 29, S.F.C. & H.S.D. |
| aquatica ..... | — | — | — | — | — | j | j | June 10, F.E.T. |
| *vernalis..... | — | — | — | a | m | — | — | April 17. |
| Melampyrum | | | | | | | | |
| pratense ..... .. | — | — | — | — | m | jj | j | May 27, J.S. |
| Pedicularis | | | | | | | | |
| palustris ..... | — | — | — | — | — | — | j | by July 15, F.E.T. |
| sylvatica..... | — | — | — | — | m | j | j | May 13, F.E.T. |
| Rhinanthus | | | | | | | | |
| Crista-galli ..... | — | — | — | — | m | j | — | May 26, F.E.T. |
| Euphrasia | | | | | | | | |
| officinalis ..... | — | — | — | — | — | j | — | June 17, F.E.T. |
| Odontites ..... | — | — | — | — | — | j | j | June 25, J.S. & F.E.T. |
| Veronica | | | | | | | | |
| scutellata ..... | — | — | — | — | m | j | — | by May 30, F.E.T. |
| anagallis ..... | — | — | — | — | m | j | j | May 28. |
| Beccabunga ... | — | — | — | — | m | jj | j | May 17, F.E.T. |
| chamædrys..... | — | — | — | a | mm | jj | j | April 17, F.E.T. |
| officinalis..... | — | — | — | — | — | j | j | June 3, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| serpyllifolia..... | — | — | — | a | m | j | — | April 26, F.E.T. |
| arvensis ..... | — | — | — | — | m | j | — | May 19, J.S. |
| agrestis ..... | — | — | — | a | ? | — | — | April 22, J.S. |
| polita ..... | h | h | h | a | m | j | j | all the year. |
| Buxbaumii ..... | h | h | h | a | m | j | j | all the year. |
| hederifolia ..... | — | f | mm | a | m | j | j | Feb. 8, J.S. |
| LABIATÆ. | | | | | | | | |
| **Mentha** | | | | | | | | |
| rotundifolia..... | — | — | — | — | — | — | — | |
| aquatica ..... | — | — | — | — | — | — | — | |
| sativa ..... | — | — | — | — | — | — | j | July 15, G.W.D.L. |
| arvensis ..... | — | — | — | — | — | — | — | |
| Pulegium ..... | — | — | — | — | — | — | — | |
| **Lycopus** | | | | | | | | |
| europæus..... | — | — | — | — | — | — | — | |
| **Salvia** | | | | | | | | |
| verbenaca ..... | — | — | — | — | m | j | — | May 14, J.S. & F.E.T. |
| **Origanum** | | | | | | | | |
| vulgare ..... | — | — | — | — | — | — | j | July 16, F.E.T. |
| **Thymus** | | | | | | | | |
| serpyllum ..... | — | — | — | — | m | jj | j | May 26, F.E.T. |
| **Calamintha** | | | | | | | | |
| officinalis... ..... | — | — | — | — | — | — | — | |
| Acinos..... | — | — | — | — | — | — | j | July 4, G.W.D.L. |
| Clinopodium ... | — | — | — | — | — | j | j | June 21, T. |
| **Scutellaria** | | | | | | | | |
| galericulata ... | — | — | — | — | — | j | j | June 13, F.E.T. |
| **Prunella** | | | | | | | | |
| vulgaris ... ..... | — | — | — | — | — | jj | jj | June 6, F.E.T. |
| **Nepeta** | | | | | | | | |
| Glechoma ..... | — | — | m | aa | mm | jj | j | March 23, F.E.T. |
| **Lamium** | | | | | | | | |
| amplexicale..... | h | h | h | a | m | j | — | all the year. |
| purpureum ..... | h | h | h | a | m | j | j | all the year. |
| album ..... | — | — | (m) | a | mm | jj | j | March 27, G.W.D.L. |
| * maculatum ... | — | — | — | a | mm | ? | — | April 3. |
| Galeobdolon ... | — | — | — | a | mm | j | — | April 26, F.E.T. |
| **Leonurus** | | | | | | | | |
| * Cardiaca ..... | — | — | — | — | — | j | — | |
| **Galeopsis** | | | | | | | | |
| * Ladanum..... | — | — | — | — | — | — | j | July 1, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tetrahit ..... | — | — | — | — | — | j | j | June 21, J.S. |
| Stachys | | | | | | | | |
| Betonica ..... | — | — | — | — | — | j | j | June 21, J.S. |
| sylvatica..... | — | — | — | — | — | jj | j | June 5, H.J.W.; J.S. |
| palustris ..... | — | — | — | — | — | — | j | July 2, J.S. |
| Ballota | | | | | | | | |
| fœtida ..... | — | — | — | — | — | j | j | June 17, F.E.T. |
| Teucrium | | | | | | | | |
| Scorodonia ..... | — | — | — | — | — | — | — | |
| Ajuga | | | | | | | | |
| reptans ..... | — | — | — | a | mm | jj | j | April 26, F.E.T. |
| VERBENACEÆ. | | | | | | | | |
| Verbena | | | | | | | | |
| officinalis..... | — | — | — | — | — | j | j | June 28, F.E.T. |
| PRIMULACEÆ. | | | | | | | | |
| Primula | | | | | | | | |
| vulgaris ..... | — | f | m | a | m | — | — | Feb. 22, J.S. (? hybernated) |
| var. variabilis ... | — | — | — | a | — | — | — | April 12, F.E.T. |
| veris..... | — | — | — | a | m | j | — | April 8, C.W.T. Ap. 10, E.W.M.L. and C.S. |
| Lysimachia | | | | | | | | |
| Nummularia ... | — | — | — | — | — | j | j | June 23, F.E.T. |
| nemorum..... | — | — | — | — | m | j | j | May 28, F.E.T. |
| Anagallis | | | | | | | | |
| arvensis ..... | — | — | — | — | m | j | j | May 20, J.S. |
| Dodecatheon | | | | | | | | |
| * meadea..... | — | — | — | — | — | — | — | |
| PLANTAGINACEÆ. | | | | | | | | |
| Plantago | | | | | | | | |
| lanceolata ..... | — | — | — | a | mm | jj | j | April 16, F.E.T. |
| media ..... | — | — | — | — | m | jj | j | May 12. |
| major ..... | — | — | — | — | — | jj | j | June 2, W.M. |

## MONOCHLAMYDEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CHENOPODIACEÆ. | | | | | | | | |
| Chenopodium | | | | | | | | |
| album ..... | — | — | — | — | — | j | j | June 13, F.E.T. |
| var. viride ..... | — | — | — | — | — | — | j | July 2, J.S. |
| rubrum ..... | — | — | — | — | — | — | — | |
| Bonus-Henricus | — | — | — | a | m | j | j | by April 25, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| triplex | | | | | | | | |
| angustifolia... .. | — | — | — | — | — | j | j | June 24, J.S. |
| deltoidea ..... | — | — | — | — | — | — | — | |
| hastata ..... | — | — | — | — | — | — | — | |
| POLYGONACEÆ. | | | | | | | | |
| Rumex | | | | | | | | |
| conglomeratus | — | — | — | — | — | j | j | bud June 17, J.S. |
| sanguineus ..... | — | — | — | — | — | — | j | July 4, F.E.T. |
| obtusifolius ..... | — | — | — | — | — | jj | jj | June 5, F.E.T. |
| crispus..... | — | — | — | — | — | j | j | June 10, F.E.T. |
| Hydrolapathum | — | — | — | — | — | — | j | July 9, F.E.T. |
| Acetosa ..... | — | — | — | — | m | jj | — | May 18, F.E.T. |
| Acetosella ..... | — | — | — | — | m | j | — | May 16, F.E.T. |
| Polygonum | | | | | | | | |
| Bistorta ..... | — | — | — | — | m | j | — | May 21, J.H.G. |
| amphibium ..... | — | — | — | — | — | j | j | June 10, J.S. |
| lapathifolium ... | — | — | — | — | — | — | j | July 2, J.S. |
| Persicaria ..... | — | — | — | — | — | j | j | June 7, J.S. |
| Hydropiper..... | — | — | — | — | — | — | — | |
| aviculare ..... | — | — | — | — | m | jj | jj | May 30, J.S. |
| Convolvulus ... | — | — | — | — | — | jj | j | June 11, J.S. |
| THYMELACEÆ. | | | | | | | | |
| Daphne | | | | | | | | |
| *Mezereum ..... | — | — | m | a | — | — | — | about March 27, J.S. |
| Laureola..... | — | f | m | — | — | — | — | Feb. 11. |
| SANTALACEÆ. | | | | | | | | |
| Thesium | | | | | | | | |
| humifusum..... | — | — | — | — | — | — | — | |
| EUPHORBIACEÆ. | | | | | | | | |
| Buxus | | | | | | | | |
| *sempervirens ... | — | — | m | a | — | — | — | March 17, F.E.T. |
| Euphorbia | | | | | | | | |
| Helioscopia..... | — | — | — | a | m | j | j | April 12, G.W.D.L. |
| amygdaloides ... | — | — | — | — | m | j | — | May 12, |
| Peplus..... | — | — | — | a | — | j | j | April 8, FET. June 12, F.E.T. |
| exigua..... | — | — | — | — | — | j | j | June 20, F.E.T. |
| Mercurialis | | | | | | | | |
| perennis..... | — | — | m | aa | mm | j | — | March 3 J.S. |
| CALLITRICHACEÆ. | | | | | | | | |
| Callitriche | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| verna ..... ..... | — | — | — | a | m | — | — | April 19, J.S. & F.E.T. |
| hamulata ..... | — | — | — | — | — | — | — | |
| URTICACEÆ. | | | | | | | | |
| Urtica | | | | | | | | |
| urens ..... | — | — | — | — | m | j | j | May 24, J.S. & F.E.T. |
| dioica ..... | — | — | — | — | m | jj | j | nearly out May 18, J.S. |
| Humulus | | | | | | | | |
| lupulus ..... | — | — | — | — | — | — | — | |
| ULMACEÆ. | | | | | | | | |
| Ulmus | | | | | | | | |
| suberosa ..... | — | — | — | — | — | — | — | |
| montana ..... | — | — | — | a | — | — | — | April 1, F.E.T. |
| AMENTIFERÆ. | | | | | | | | |
| Salix | | | | | | | | |
| alba ..... | — | — | — | — | — | — | — | |
| triandra ..... | — | — | — | a | m | — | — | April 14, F.E.T. |
| purpurea..... | — | — | — | — | — | — | — | |
| rubra ..... | — | — | — | — | — | — | — | |
| viminalis..... | — | — | — | a | P | — | — | by April 14, F.E.T. |
| caprea ..... | — | — | m | a | — | — | — | March 21 F.E.T. |
| fusca ..... | — | — | — | — | — | — | — | |
| Populus | | | | | | | | |
| alba ..... | — | — | — | — | — | — | — | |
| nigra ..... | — | — | m | a | — | — | — | March 22, and 29 J.S. |
| *fastigita ..... | — | — | — | — | — | — | — | |
| Betula | | | | | | | | |
| glutinosa..... | — | — | — | a | — | — | — | April 18, F.E.T. |
| Alnus | | | | | | | | |
| glutinosa..... | — | — | — | — | m | P | — | (bud) May 24, J.S. & F.E.T. |
| Fagus | | | | | | | | |
| sylvatica..... | — | — | — | — | — | — | — | no flowers could be found |
| Castanea | | | | | | | | |
| vulgaris ..... | — | — | — | — | — | — | j | July 16, F.E.T. |
| Quercus | | | | | | | | |
| Robur ..... | — | — | — | — | m | — | — | May 18, J.S. & F.E.T. |
| Corylus | | | | | | | | |
| Avellana..... | — | f | m | aa | — | — | — | fertile by Feb. 10, barren Feb. 26. |
| Juglans | | | | | | | | |
| *regia ..... | — | — | — | — | m | — | — | May 22, |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Carpinus | | | | | | | | |
| betulus ..... | — | — | — | a | — | — | — | April 26, F. E. T. |

## GYMNOSPERMEÆ.

### Coniferæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Taxus | | | | | | | | |
| baccata ..... | — | — | m | — | — | — | — | March 12, F.E.T. |
| Juniperus | | | | | | | | |
| communis ..... | — | — | — | a | — | — | — | April 25, F.E.T. |
| Pinus | | | | | | | | |
| sylvestris ..... | — | — | — | — | — | j | — | by June 5, J.S. & F.E.T. |
| Larix | | | | | | | | |
| *europæa ..... | — | — | m | a | — | — | — | March 26. |

## MONOCOTYLEDONS.

### Trilliaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Paris | | | | | | | | |
| quadrifolia ..... | — | — | — | — | m | — | — | full fl. May 18, W.G. |

### Dioscoreaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Tamus | | | | | | | | |
| communis ..... | — | — | — | — | m | jj | j | May 30, J.S. |

### Hydrocharidaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Anacharis | | | | | | | | |
| Alsinastrum ... | — | — | — | — | — | j | | by June 6. |

### Orchidaceæ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Orchis | | | | | | | | |
| Morio ..... | — | — | — | — | m | j | — | May 12, F.E.T. |
| mascula ..... | — | — | — | a | m | j | — | April 19 J.S. & F.E.T. |
| ustulata ..... | — | — | — | — | m | — | — | May 29, J.S. |
| maculata..... | — | — | — | — | m | jj | j | May 30, J.S. |
| latifolia ..... | — | — | — | — | — | — | j | full fl. July 15, F.E.T. |
| incarnata..... | — | — | — | — | m | j | — | May 26, J.S. |
| pyramidalis ... | — | — | — | — | — | j | j | June 18, J.S. |
| Gymnadenia | | | | | | | | |
| conopsea ..... | — | — | — | — | — | jj | — | June 14, J.S. |
| Habenaria | | | | | | | | |
| viridis ..... | — | — | — | — | — | — | — | |
| bifolia ..... | — | — | — | — | — | — | — | |
| chlorantha ..... | — | — | — | — | m | j | j | May 21. J.S. |
| Ophrys | | | | | | | | |
| apifera..... | — | — | — | — | — | — | — | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Spiranthes** | | | | | | | | |
| autumnalis ..... | — | — | — | — | — | — | — | |
| **Listera** | | | | | | | | |
| ovata ..... | — | — | — | — | m | j | j | May 20, G.W.D.L. |
| **Neottia** | | | | | | | | |
| Nidus-avis | — | — | — | — | ? | j | j | full fl. June 11, J.B.F. and G.H.P. |
| **Epipactis** | | | | | | | | |
| latifolia ..... | — | — | — | — | — | — | j | July 24, J.S. |
| **Cephalanthera** | | | | | | | | |
| grandiflora ..... | — | — | — | — | — | — | — | |
| IRIDACEÆ. | | | | | | | | |
| **Iris** | | | | | | | | |
| Pseud-acorus | — | — | — | — | m | jj | j | May 30, F.E.T. |
| fœtidissima..... | — | — | — | — | — | j | j | June 26. |
| **Crocus** | | | | | | | | |
| *aureus ..... | — | — | f | m | a | — | — | Feb. 11 over April 12. |
| AMARYLLIDACEÆ. | | | | | | | | |
| **Narcissus** | | | | | | | | |
| biflorus ..... | — | — | — | — | — | — | — | |
| Pseudo-narcissus | — | — | m | aa | — | — | — | March 25, F.E.T. |
| **Leucojum** | | | | | | | | |
| *æstivum ..... | — | — | — | — | — | — | — | |
| **Galanthus** | | | | | | | | |
| nivalis ..... | — | f | mm | — | — | — | — | *Feb. 11. |
| ASPARAGACEÆ. | | | | | | | | |
| **Convallaria** | | | | | | | | |
| *majalis ..... | — | — | — | — | — | — | — | |
| **Polygonatum** | | | | | | | | |
| multiflorum..... | — | — | — | — | m | j | — | May 12, F.E.T |
| **Ruscus** | | | | | | | | |
| aculeatus..... | — | — | m | a | — | — | — | March 5, F.E.T. |
| LILIACEÆ. | | | | | | | | |
| **Tulipa** | | | | | | | | |
| sylvestris..... | — | — | — | a | — | — | — | April 19, (Alton) C.A.S. |
| **Fritillaria** | | | | | | | | |
| *Meleagris..... | — | — | — | a | — | — | — | April 18 |
| *Imperialis ..... | — | — | — | a | — | — | — | April 12. |
| **Ornithogalum**..... | | | | | | | | |
| umbellatum ... | — | — | — | — | m | j | — | May 26, (Alton) C.A.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Scilla | | | | | | | | |
| *bifolia | — | — | — | — | — | — | — | |
| *sibirica | — | — | m | — | — | — | — | March 6. |
| *amœna | — | — | m | — | — | — | — | March 10. |
| Allium | | | | | | | | |
| vineale | — | — | — | — | — | j | — | June 21. |
| ursinum | — | — | — | — | m | j | — | full fl. May 20, J.S. |
| Endymion | | | | | | | | |
| nutans | — | — | — | a | mm | j | — | April 22, F.E.T. |
| Muscari | | | | | | | | |
| *botryoides? | — | — | — | a | — | — | — | by April 15. |
| COLCHICACEÆ. | | | | | | | | |
| Colchicum | | | | | | | | |
| autumnale | — | — | — | — | — | — | — | |
| JUNCACEÆ. | | | | | | | | |
| Juncus | | | | | | | | |
| effusus | — | — | — | — | — | — | j | July 9. |
| conglomeratus | — | — | — | — | — | — | — | |
| glaucus | — | — | — | — | — | j | j | June 25, J.S. & F.E.T. |
| diffusus | — | — | — | — | — | — | j | July 6. |
| obtusiflorus | — | — | — | — | — | — | j | July 6. |
| acutiflorus | — | — | — | — | — | — | | July 9. |
| lamprocarpus | — | — | — | — | — | j | j | June 25, J.S. & F.E.T. |
| bufonius | — | — | — | — | — | — | — | |
| Luzula | | | | | | | | |
| pilosa | — | — | — | a | m | — | — | April 11, F.E.T. |
| campestris | — | — | — | a | m | j | — | April 19. J.S. & F.E.T. |
| ALISMACEÆ. | | | | | | | | |
| Alisma | | | | | | | | |
| Plantago | — | — | — | — | — | | | June 17, J.S. |
| Sagittaria | | | | | | | | |
| sagittifolia | — | — | — | — | — | — | j | July 5, J.S. |
| Butomus | | | | | | | | |
| umbellatus | — | — | — | — | — | j | j | June 28, F.E.T. |
| Triglochin | | | | | | | | |
| palustre | — | — | — | — | — | — | — | |
| TYPHACEÆ. | | | | | | | | |
| Typha | | | | | | | | |
| latifolia | — | — | — | — | — | — | — | |
| Sparganium | | | | | | | | |
| ramosum | — | — | — | — | — | | j | June 17, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| simplex ..... | — | — | — | — | — | — | j | July 8, J.S. |
| **ARACEÆ.** | | | | | | | | |
| Arum | | | | | | | | |
| maculatum ..... | — | — | — | a | m | — | — | April 16, F.E.T. (spathe no open) |
| **LEMNACEÆ.** | | | | | | | | |
| Lemna | | | | | | | | |
| minor ..... | — | — | — | — | — | — | — | |
| gibba ..... | — | — | — | — | — | — | — | |
| polyrrhiza ..... | — | — | — | — | — | — | — | |
| **POTAMOGETONACEÆ.** | | | | | | | | |
| Potamogeton | | | | | | | | |
| natans ..... | — | — | — | — | m | — | — | full fl. May 28, F.E.T. |
| lucens ..... | — | — | — | — | — | — | — | |
| perfoliatus ..... | — | — | — | — | — | j | — | June 17, J.S. |
| crispus..... | — | — | — | — | — | — | — | |
| compressus ..... | — | — | — | — | — | j | — | by June 6. |
| pectinatus ..... | — | — | — | — | — | j | — | by June 6. |
| densus ..... | — | — | — | — | m | j | — | May 28. |
| Zannichellia | | | | | | | | |
| palustris ..... | — | — | — | — | — | — | — | |
| **CYPERACEÆ.** | | | | | | | | |
| Eleocharis | | | | | | | | |
| palustris ..... | — | — | — | — | m | j | j | full fl. May 28, F.E.T. |
| Scirpus | | | | | | | | |
| lacustris ..... | — | — | — | — | — | j | — | bud June 3, J.S. |
| Carex | | | | | | | | |
| pulicaris ..... | — | — | — | — | ? | — | — | seed June 9. |
| vulpina ..... | — | — | — | — | m | j | — | May 21, F.E.T. |
| divulsa ..... | — | — | — | — | m | j | — | May 20, J.S. |
| paniculata ..... | — | — | — | — | m | j | — | May 18, J.S. |
| remota..... | — | — | — | — | — | j | — | |
| ovalis ..... .. | — | — | — | — | — | — | — | |
| pendula ..... | — | — | — | — | m | — | — | full fl. May 22. |
| præcox ..... | — | — | — | — | m | — | — | May 13, J.S. & F.E.T. |
| pilulifera ..... | — | — | — | — | m | — | — | May 26, F.E.T. |
| glauca ..... | — | — | — | — | m | j | — | May 12, J.S. & F.E.T. |
| sylvatica ..... | — | — | — | — | m | j | — | May 18, J.S. |
| hirta ..... | — | — | — | — | m | j | j | full fl. May 28, F.E.T. |
| paludosa ..... | — | — | — | — | m | j | — | May 14. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| riparia..... | — | — | — | — | m | | — | May 14. |
| GRAMINEÆ. | | | | | | | | |
| Phalaris | | | | | | | | |
| arundinacea ... | — | — | — | — | — | jj | j | June 3, J S. |
| Anthoxanthum | | | | | | | | |
| odoratum ..... | — | — | — | — | mm | j | j | May 12. |
| Phleum | | | | | | | | |
| pratense ..... | — | — | — | — | — | jj | j | June 14 F.E.T. |
| Alopecurus | | | | | | | | |
| pratensis..... | — | — | — | a | mm | jj | j | April 19, J.S. & F.E.T. |
| geniculatus..... | — | — | — | — | m | j | — | May 27, J.S. |
| agrestis ..... | — | — | — | — | m | j | j | May 18, F.E.T. |
| Milium | | | | | | | | |
| effusum ..... | — | — | — | — | m | j | — | May 18, F.E.T. |
| Phragmites | | | | | | | | |
| communis ..... | — | — | — | — | — | — | — | |
| Agrostis | | | | | | | | |
| vulgaris ..... | — | — | — | — | — | j | j | June 24, J.S. |
| alba ..... | — | — | — | — | — | j | j | June 23, F.E.T. |
| Holcus | | | | | | | | |
| lanatus ..... | — | — | — | — | m | jj | j | May 21, F.E.T. |
| mollis ..... | — | — | — | — | — | j | j | June 14, F.E.T. |
| Aira | | | | | | | | |
| cæspitosa ..... | — | — | — | — | — | j | j | June 13, F.E.T. |
| flexuosa ..... | — | — | — | — | — | — | — | |
| caryophyllea ... | — | — | — | — | — | — | — | |
| Trisetum | | | | | | | | |
| flavescens ... .. | — | — | — | — | — | jj | (j) | June 7. |
| Avena | | | | | | | | |
| pratensis..... | — | — | — | — | m | j | (j) | May 20, J.S. |
| pubescens ..... | — | — | — | — | m | j | — | May 18, J.S. & F.E.T. |
| Arrhenatherum | | | | | | | | |
| avenaceum ..... | — | — | — | — | m | jj | j | May 21, F.E.T |
| Kœleria | | | | | | | | |
| cristata ..... | — | — | — | — | j | — | — | June 2. |
| Melica | | | | | | | | |
| uniflora ..... | — | — | — | — | m | j | — | May 21, J.S. |
| Poa | | | | | | | | |
| annua ..... | h | h | h | a | m | j | j | all the year. |
| nemoralis ..... | — | — | — | — | — | — | — | |
| trivialis ..... | — | — | — | — | mm | jj | j | May 19, J.S. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| pratensis ..... | — | — | — | a | mm | j | j | April 19, J.S. & F.E.T. |
| Glyceria | | | | | | | | |
| aquatica ..... | — | — | — | — | — | j | j | June 11, F.E.T. |
| fluitans ..... | — | — | — | — | m | j | j | by May 27, J.S. |
| plicata ..... | — | — | — | — | m | j | j | by May 26, J.S. |
| Sclerochloa | | | | | | | | |
| rigida ..... | — | — | — | — | — | — | — | |
| Briza | | | | | | | | |
| media ..... | — | — | — | — | m | jj | j | May 25, J.S. F.E.T. |
| Catabrosa | | | | | | | | |
| aquatica ..... | — | — | — | — | j | — | — | by June 7, J.S. |
| Cynosurus | | | | | | | | |
| cristatus ..... | — | — | — | — | m | jj | j | May 26, F.E.T. May 24, (Bicknoll) |
| Dactylis | | | | | | | | |
| glomerata ..... | — | — | — | — | m | jj | j | May 14, J.S. and F.E.T. |
| Festuca | | | | | | | | |
| sciuroides ..... | — | — | — | — | — | j | — | June 7, J.S. |
| ovina ..... | — | — | — | — | m | j | — | May 19, J.S. |
| rubra ..... | — | — | — | — | m | j | — | May 18, F.E.T. |
| gigantea ..... | — | — | — | — | — | j | j | June, 21, F.E.T. |
| arundinacea ... | — | — | — | — | — | j | — | June 6. |
| pratensis..... | — | — | — | — | — | j | — | June 17, J S. |
| var. loliacea ... | — | — | — | — | — | j | — | |
| Bromus | | | | | | | | |
| erectus..... | — | — | — | — | m | jj | — | May 18, F.E.T. |
| asper ..... | — | — | — | — | — | j | j | June 9. |
| sterilis..... | — | — | — | — | mm | jj | (j) | May 12, J.S. and F.E.T. |
| Serrafalcus | | | | | | | | |
| secalinus..... | — | — | — | — | — | — | — | |
| racemosus ..... | — | — | — | — | — | — | — | |
| commutatus ... | — | — | — | — | — | — | — | |
| mollis ..... | — | — | — | — | mm | jj | j | May 12, J.S. and F.E.T. |
| Brachypodium | | | | | | | | |
| sylvaticum ..... | — | — | — | — | — | — | — | |
| Triticum | | | | | | | | |
| caninum ..... | — | — | — | — | — | — | — | |
| repens ..... | — | — | — | — | — | j | j | June 9, F.E |
| Hordeum | | | | | | | | |
| pratense ..... | — | — | — | — | — | j | j | full fl. n 21, F.E.T. |
| murinum..... | — | — | — | — | — | — | — | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lolium | | | | | | | | |
| perenne ..... | — | — | — | — | m | jj | j | May 12. |
| Rye ..... | — | — | — | — | — | — | — | May 20, F.E.T. |
| Wheat ..... | — | — | — | — | — | — | — | ears appearing June 9, F.E.T |
| Oats ..... | — | — | — | — | — | — | — | June 6, F:E.T. |
| Barley ..... | — | — | — | — | — | — | — | June 13, F.E.T. |

## CRYPTOGAMS.

### EQUISETACEÆ.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Equisetum | | | | | | | | |
| arvense ..... | — | — | — | a | m | — | — | April 16, F.E.T. |
| maximum ..... | — | — | — | ? | — | — | — | |
| sylvaticum ..... | — | — | — | ? | — | — | — | |
| limosum ..... | — | — | — | a | m | j | j | April 18, F.E.T. (nearly open) |
| palustre ..... | — | — | — | — | m | j | j | May 28, F.E.T. |

### FILICES.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Polypodium | | | | | | | | |
| vulgare | | | | | | | | |
| Lastrea | | | | | | | | |
| Oreopteris | | | | | | | | |
| Filix-mas ..... | — | — | — | — | — | — | — | 1 ft. high May 18, J.S. |
| dilatata | | | | | | | | |
| Polystichum | | | | | | | | |
| aculeatum | | | | | | | | |
| Athyrium | | | | | | | | |
| Filix-fœmina | | | | | | | | |
| Asplenium | | | | | | | | |
| Adiantum-nigrum | | | | | | | | |
| Trichomanes | | | | | | | | |
| Ruta-muraria | | | | | | | | |
| Scolopendrium | | | | | | | | |
| vulgare | | | | | | | | |
| Blechnum | | | | | | | | |
| boreale | | | | | | | | |
| Pteris | | | | | | | | |
| aquilina | | | | | | | | |
| Botrychium | | | | | | | | |
| lunaria ..... | — | — | — | — | m | j | — | May 15, J.B.O. |
| Ophioglossum | | | | | | | | |
| vulgatum | | | | | | | | |

## NEW LOCALITIES, &c.

| | |
|---|---|
| Myosurus minimus ... ... | Huish, J.S. |
| Ranunculus trichophyllus ... | Canal between Pewsey and Oare, J.S. |
| R. hederaceus... ... ... ... | Bedwyn, J.S. This locality, though recorded in the Flora of Marlborough, has never been confirmed till this year. |
| R. Flammula ... .. ... ... | Pond West of Chisbury, J.S. |
| R. sceleratus ... ... ... ... | Bicknoll J.S. and F.E.T. |
| Papaver Argemone ... ... | Martinsell, J.S. Huish, J.S. |
| P. Lecoqii ... ... ... ... | Poulton, F.E.T. |
| Senebiera coronopus ... ... | Avebury, F.E.T.; Field near Cricket Field, Marlborough College. |
| Armoracia rusticana ... ... | Fyfield, J.S. |
| Arabis hirsuta ... ... ... | Overton, J.S. |
| Nasturtium palustre ... ... | Avebury, F.E.T. |
| Erysimum cheiranthoides ... | (Small, but apparently wild) Avebury, F.E.T. |
| Raphanus Raphanistrum ... | Oare, J.S. |
| Reseda lutea ... ... ... ... | Rockley, J.B.G.; Broad Hinton, F.E.H. |
| Viola Reichenbachiana ... ... | Rabley, F.E.T. |
| Stellaria uliginosa ... ... ... | Common in marshy spots. |
| Geranium columbinum ... ... | Stitchcomb, J.S. |
| G. lucidum ... ... ... ... | Stitchcomb, J.S. |
| Sarothamnus scoparius .. ... | Near the Wan's Dyke; A.A.G.; Pewsey, J.S. Savernake, F.E.T. |
| Genista tinctoria ... ... ... | Overton, J.S.; Field near Martinsell, J.S.; Bedwyn Common, J.S.; Bedwyn Brails, F.E.T. |
| Ononis campestris ... ... ... | Oare Hill, J.S. |
| Medicago sativa ... ... ... | Field behind Barton Farm, S.F.T. |
| Vicia sativa ... ... ... ... | White var. near Oare, J.S. |
| V. tetrasperma ... ... ... | Woodborough, F.E.T.; Stitchcomb, J.S. |
| V. gracilis ... ... ... ... | Pewsey, J.S. |
| Prunus cerasus ... ... ... | Wan's Dyke, near the Pewsey Road. |
| Spiræa Filipendula ... ... | Overton, J.S. |
| Rubus Radula ... ... ... | Manton Copse. |
| R. cerylifolius... ... ... ... | near the Railway Station, Marlborough; Mildenhall. |
| Pyrus Aria ... ... ... ... | Bicknoll, J.B.G. |
| Epilobium angustifolium ... | Copse near Wilcot, J.S.; Avebury, F.E.T. |

| | |
|---|---|
| E. palustre ... ... ... ... | New Mill, J.S.; Wilcot, J.S.; between Savernake and Bedwyn, J.S. & G.W.D.L. |
| Circæa lutetiana ... ... ... | Wilcot, J.S.; Savernake, J.S.; Bedwyn, J.S. and F.E.T.; Bicknoll, J.B.G. |
| Chrysosplenium oppositifolium | Wootton Rivers, F.E.T. |
| Apium graveolens ... .. ... | New Mill, J.S. |
| Helosciadium inundatum ... | Pond near Chisbury, J.S. |
| Silaus pratensis ... ... ... | Ogbourn, G.W.D.L,; Silbury, F.E.T. |
| Torilis infesta ... ... ... ... | Wilcot; Woodborough, J.S.; Bedwyn, J.S. and G.W.D.L. |
| Asperula cynanchica ... ... | Generally distributed. |
| Valeriana dioica ... ... ... | Bedwyn, Huish, Elcott Mill, Axford. |
| Valerianella olitoria ... ... | Huish. Clatford, J.S. |
| V. dentata ... ... ... ... | Overton, J.S. |
| Hieracium boreale ... ... ... | Oare, J.S.; Bedwyn, J.S.; F.E.T. G.W.D.L. Mildenhall Borders, J.S. and F.E.T. |
| Serratula tinctoria... ... ... | Near the Workhouse, Marlborough, R.E.D. |
| Carduus crispus ... ... ... | White var. Preshute, A.B. |
| C. eriophorus ... ... ... ... | Bicknoll, J.S. and F.E.T.; Vale behind Ivy's Farm F.E.T. |
| Centaurea nigra ... ... ... | White var. New Mill, J.S. |
| C. Cyanus ... ... ... ... | New Mill, J.S. |
| Senecio campestris ... ... | Martinsell, J.S. Broad Hinton, J.B.G. |
| Specularia hybrida... ... ... | Half-a.mile E. of Oare, J.S. |
| Menyanthes trifoliata ... ... | Water meadows above Stitchcomb, J.S. |
| Polemonium cæruleum... ... | Pewsey, F.E.T.; Woodborough, J.S.; F.E.T. Savernake, J.S. |
| Cuscuta trifolii ... ... ... | Martinsell, S.C.V.F. |
| Melampyrum pratense ... ... | White Horse Down, J.M.L.D. |
| Linaria minor... ... ... ... | Overton, J.S.; Railway bank at Marlborough Station and Granham Hill, J.S. |
| Orobanche elatior ... ... ... | Row Down, A.B.; Ogbourne, G.W.D.L.; Overton, J.S. |
| O. minor ... ... ... ... ... | Branched specimen, A.B.; specimen growing on *Carduus arvensis* A.B. |
| Verbena officinalis ... ... ... | Axford, F.E.T. Between Chisbury and Bedwyn, J.S. |
| Salvia Verbenaca ... ... ... | Mildenhall. |
| Ajuga reptans... ... ... ... | white var. J.B.F. and E.L.H. |
| Echium vulgare ... ... ... | Bedwyn Brails F.E.T. |
| Lysimmachia Nummularia ... | Common in the Water Meadows. |

| | |
|---|---|
| Chenopodium viride ... ... | New Mill, J.S. |
| C. Bonus Henricus... ... ... | Railway Station, Marlborough, J.S., Bicknoll, J.S. & F.E.T., Mildenhall. |
| Polygonum Bistorta ... ... | Woodborough, J.S. |
| Orchis incarnata ... ... ... | Great Bedwyn, F.E.T. |
| Gymnadenia conopsea ... ... | Rainscombe, J.S. ; Silbury, F.E.T. |
| Tulipa sylvestris ... ... ... | Honey Street, C.A.S. |
| Allium vineale ... ... ... | Row Down, A.B. ; Near Barton Farm, S.F.T. |
| A. ursinum ... ... ... ... | Bicknoll, J.B.G. ; Woodborough, J.S. |
| Ornithogalum umbellatum ... | Manton, W.H.K.W. |
| Paris quadrifolia ... ... ... | Bicknoll. |
| Sagittaria sagittifolia ... ... | Wilcot, J.S. |
| Butomus umbellatus ... ... | Wilcot, J.S. : Marlborough Water Meadows, S.F.T. |
| Sparganium simplex ... ... | Wilcot, J.S. |
| Juncus lamprocarpus ... ... | Stitchcomb, J.S. & F.E.T. |
| Carex vulpina... ... ... .. | Huish, F.E.T. |
| C. paniculata ... ... ... ... | Canal Banks ; Poulton, J.S. |
| C. pendula ... ... ... ... | Bicknoll, J.B.G. |
| C. hirta ... ... ... ... ... | Woodborough, J.S. ; Huish ; Wilcot, J.S. & F.E.T. ; Poulton, J.S. ; Elcott Mill ; Mildenhall. |
| Catabrosa aquatica ... ... | Woodborough, J.S. |
| Festuca sciuriodes... ... ... | Between Woodborough and Pewsey, J.S. |
| F. arundinacea ... ... ... | Huish ; Axford. |
| Serrafalcus secalinus ... ... | Mildenhall. |
| S. racemosus ... ... ... ... | Mildenhall ; Overton, J.S. ; Wilcot. |

## NEW SPECIES.

| | |
|---|---|
| Ranunculus pseudo-fluitans ... | Canal near Savernake. |
| Nuphar lutea ... ... ... ... | Canal near Great Bedwyn, J.S. |
| Papaver Rhœas, var. Strigosum | Poulton, F.E.T. |
| [P. somniferum ... ... ... | Railway Bank, Marlborough, F.E.T. ; Manton, G.T.P.C.] |
| Thlaspi arvense ... ... ... | Pewsey, J.S. ; Woodborough, J.S., F.E.T. |
| [Cheiranthus Cheiri ... ... | Railway Bank, J.S. This is the only specimen hitherto observed which can be called at all wild near Marlborough.] |
| [Alyssum incanum ... ... | Near the Reservoir, Crofton, in a clover field, G.W.D.L.] |

| | |
|---|---|
| Linum usitatissimum ... ... | Mildenhall, Mrs. Thompson. |
| Trifolium hybridum ... ... | Wilcot. |
| Lathyrus Aphaca ... ... ... | Road between Chisbury and Bedwyn, J.S. |
| Rosa tomentosa ... ... ... | (not R. micrantha, as formerly recorded), Wood near Bedwyn, J.S.; Chisbury, J.S.; Rainscomb, J.S. |
| R. rubiginosa ... ... ... ... | White Horse Down, J.M.L.D. |
| Dipsacus pilosus ... ... ... | Young plants, apparently of this species, were found by J.B.G., at Bicknoll. |
| Hieracium murorum ... ... | Bedwyn Brails, F.E.T. |
| Onopordum acanthium ... ... | New Mill, J.S. |
| Senecio erucifolius... ... ... | Bedwyn, F.E.T. |
| Veronica Scutellata ... ... | Axford, F.E.T.; Elcott Mill, W.M. |
| Mentha Sativa ... ... ... | Between Savernake and Bedwyn, G.W.D.L. |
| Alnus glutinosa ... ... ... | Bicknoll, J.S. & F.E.T.; Woodborough, J.S.; New Mill, J.S. |
| Salix purpurea ... ... ... | Mildenhall; Canal bank near Crofton. |
| Potamogeton pectinatus ... | Wilton, J.S. |
| P. compressus... ... .. ... | Wilton, J.S. |
| Lemna polyrrhiza ... ... ... | Wilton, J.S. |
| L. gibba ... ... ... ... ... | Pond at Milton, J.S. & F.E.T. |
| Juncus diffusus ... ... ... | Wilcot, J.S. |
| J. obtusiflorus... ... ... ... | Wilcot, J.S. & F.E.T. |
| Carex remota ... ... ... ... | Great Bedwyn, F.E.T. |
| C. ampullacea ... ... ... | Huish. |
| C. intermedia... ... ... ... | Axford; Woodborough, J.S.; Elcott Mill. |
| Equisetum maximum ... ... | Bicknoll, J.B.G. |

## DONATIONS TO THE MUSEUM.

*Archæology.*—

"Kimmeridge Money" by Rev. J. S. Thomas.

Spoon and Toy from the South Sea Islands, by E. W. Swetenham.

Slag from an old Roman Furnace in South Wales, by H. A. M. Power.

Old Bible, by Mr. Cane.

Two old original works on Scientific Subjects, by Mr. Rowe.

Indian Basket and Shells, by F. D. How.

Burmese Idols, by H. C. Spry,

Samian Ware, by E. L. Hesketh.

Indian Mosquito Brush, by H. S. Sankey.

Ordinary Dress of Australian Woman, by H. S. Sankey.

Coins by Mrs. S. B. Merriman, E. R. Edgell, G. E. Manisty, H. W. Simpkinson, C. E. Down, G. H. Perry.

*Geology.*—

Stag's Horn from below the foundations of Caerphilly Castle, specimen of Stratum from Watchet, Somersetshire, and cast of Trilobite, by C. R. Waldron.

"Petrified Moss" from Whitby, by G. Nares.

Fossil from Maestricht, by C. R. Carr, Esq.

Fossils from the Isle of Wight, by F. Storr, Esq.

Fossils and Minerals, by F. H. Thilwall and H. C. Tillard.

Large Crystal of Quartz by H. C. Spry.

*Entomology.*—

Black-veined White Butterfly (*A. Cratægi*), by W. H. Williams.

*Ornithology.*—

Two Love-Bird's eggs from Australia, by F. Leigh.

Eggs of Ring Ouzel, Swift, Black-headed Bunting, Hooded Crow, Kestrel and Gull, First Eggs of Pullet, Partridge, and Pheasant, by E. C. Sewell, Esq.

Egg of Guillemot, by F. H. Thirwall.

Gold and Silver Pheasants, by Mr. W. Gauntlett.

Nest of Willow Wren, by A. C. Almack, Esq.

Nest of Reed Warbler, by G. C. Mansel.

Skin of Moorhen, by W. S. Bambridge, Esq.

*Various.*—

Spine of Fish, by E. C. Sewell, Esq.
Collection of Gums, by Rev. C. E. Thorpe.
Specimen of Sugar of Milk, by H. T. King.
Ordnance Map of Marlborough, by G. E. Frere, Esq., F.R.S.

*Library.*—

Journal of Linnean Society and Miller's "Footprints of the Creator" } by F. E. Hulme, Esq., F.L.S.
Terraces of Norway, by A. S. Marshall Hall.
Simonin's "Underground Life," by W. Fergus, Esq., M.D.
Rugby Natural History Society's Report, by the Society.
Popular Science Review, The Student } by Rev. J. M. Fuller.

## DONATIONS TO THE FUNDS OF THE SOCIETY.

| | £ | s. | d. |
|---|---|---|---|
| M. H. Smith, Esq. ... ... ... ... ... | 0 | 2 | 0 |
| A. Armstrong, Esq.... ... ... ... ... | 0 | 2 | 6 |
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| Mrs. Norris ... ... ... ... ... .. | 1 | 1 | 0 |
| Mrs. Keeling ... ... ... ... ... .. | 0 | 2 | 6 |
| | £1 | 18 | 6 |

## REPORTS.

| | |
|---|---|
| No. printed ... ... ... ... ... | 400 |
| Sold ... ... ... ... ... ... ... ... ... ... | 268 |
| Given away ... ... ... ... ... ... ... | 78 |
| In hand ... ... ... ... ... ... ... ... | 54 |
| | 400 |

# ACCOUNTS.

| Receipts. | £ | s. | d. | Expenditure. | £ | s. | d. |
|---|---|---|---|---|---|---|---|
| Balance in hand ... ... | 5 | 8 | 7 | Zoologist for 1866 ... ... | 0 | 18 | 3 |
| Compositions ... ... ... | 7 | 7 | 0 | Subs. to Wilts Archæological Society ... ... | 0 | 10 | 6 |
| Subscriptions—Honorary Members ... ... ... | 3 | 0 | 0 | Bill for printing, extra ... | 1 | 13 | 10 |
| Do. Members ... ... ... | 3 | 3 | 0 | Labels for Museum... .. | 0 | 10 | 0 |
| Arrears ... ... ... ... | 1 | 12 | 0 | Printing Report for Christmas 1869 ... ... ... | 18 | 5 | 0 |
| Donations ... ... ... ... | 1 | 18 | 6 | „ Notices ... ... | 0 | 7 | 6 |
| Sale of back Reports ... | 1 | 0 | 6 | Candles, &c. ... ... ... | 0 | 8 | 6 |
| „ Reports for Christmas 1869 ... ... | 20 | 2 | 0 | Field day ... ... ... ... | 1 | 0 | 2 |
| | | | | Birds and stuffing ... ... | 0 | 13 | 6 |
| | | | | Stationery... ... ... ... | 0 | 4 | 0 |
| | | | | Deposited in Bank ... ... | 15 | 0 | 0 |
| | | | | Balance in hand ... ... | 4 | 0 | 4 |
| | £43 | 11 | 7 | | £43 | 11 | 7 |

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J. B. FULLER. } Auditors.

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BEING

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TO THE

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BY

EVERARD F. IM THURN.

WITH AN APPENDIX.

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MDCCCLXX.

August 6 1794. If you come across
any MSS which do not come to
Keats then refer, I wish very
much to have them.

Very sincerely
T. L. Peacock

T. Hyman

# REPORT

OF THE

## MARLBOROUGH COLLEGE

# Natural History Society,

FOR THE

## HALF-YEAR,

## ENDING CHRISTMAS, 1870.

"TUM MIHI NATURÆ LIBEAT PERDISCERE MORES:
QUIS DEUS HANC MUNDI TEMPERET ARTE DOMUM."

MARLBOROUGH:
PRINTED BY C. PERKINS, TIMES OFFICE.
1871.

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## Secretary.

W. D. Fenning.

## Treasurer.

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## Librarian.

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* Heads of Sections.

# PREFACE.

THE principal event of the past half-year has been the Conversazione, a full report of which will be found in the proper place. In passing we may, without seeming presumptuous, pronounce it a decided success. The best thanks of the Society are due to the Members of the Common-Room for their hearty and liberal co-operation.

The Sections have continued their work, but from pressure of other matter only a very few Reports of it will be found in the present number. Next half-year we hope to publish more detailed lists.

The Collections are in good order and have been considerably increased, especially by extensive donations from J. E. OLLIVANT, ESQ., and by C. E. POWELL, ESQ., from the collections of his late Father, DR. POWELL.

The Sale of the "Birds of Marlborough" has been so far successful (through the exertions more especially of R. W. DOYNE) that the Author will lose much less than was anticipated, though he is still out of pocket by it.

As an Appendix to the Report, the first part of a Second Edition of the "Flora of Marlborough" is published. It differs considerably from the former edition in giving such descriptions of the species as will enable beginners to name the specimens they find. It also summarises the observations of the past six years.

As the "Antiquities of Marlborough," by the late Dr. Cotton, is entirely out of print, the Committee have decided on reprinting it. Copies will probably be ready soon after the return of the School in February next.

The Committee have not added many books to the Library, but have commenced taking in some of the Periodicals on Natural History; they seem to be in great request, and to justify the expenditure.

The Committee cannot conclude without alluding to the great loss which the Society, in common with the whole School, have sustained by the translation of the Master to Oxford. From the very commencement of the Society he has been one of its firmest supporters, and has ungrudgingly aided it in every possible way; and though his name has not appeared among the list of Benefactors, his loss will be most severely felt, as the aid he rendered was done in the most unobtrusive manner. Even amidst his many duties, he not unfrequently made time to give us the great aid of his presence at our meetings: whilst the fact of the Society's existence being known so widely as it is, is mainly due to the great liberality with which he was in the habit of distributing our Reports, the purchase of which formed the most important item in the Receipts of the Society.

It only remains to thank all those kind Friends who have in any way aided the Society. A full List of Donations will be found elsewhere, but the Committee cannot help mentioning more especially the names of J. E. Ollivant, Esq., and C. E. Powell, Esq., for their contributions to the Museum already referred to; Mrs. Elizabeth Twining for a copy of her beautiful work on "The Natural Orders of Plants," and the Rev. J. M. Fuller, for the "Student" and "Popular Science Review."

# RULES.

1.—That this society be called the Marlborough College Natural History Society.

*Constitution.*

2.—That the Society consists of Members and Honorary Members.

*Officers.*

3.—That the Officers of the Society consist of a President, Secretary, Treasurer, and Librarian, to be elected from and by members of the Society.

*Management.*

4.—That the affairs of the Society be conducted by a Committee, consisting of the President, Secretary, and three other members of the society, to be elected from and by Members of the Society; three of whom shall form a Quorum.

*President.*

5.—That in case of an equality of votes, the President shall have a double or casting vote.

6.—That in the absence of the President, the Committee be empowered to request any Member of the Society to take the chair.

*Committee.*

7.—That on the occurrence of any election, each Member of the Committee have double the number of votes of any other member of the Society.

8.—That two Members be appointed half-yearly by the Society, to assist the Secretary in editing the Report.

*Secretary.*

9.— That the duties of the Secretary be to keep a list of all the Members of the Society, and of all former Members and Benefactors who may wish to receive the reports of the Society; to summon meetings (when necessary) of the Society; to keep a detailed report of the proceedings, as well as lists of Members and Visitors present at each meeting, and generally to act under the direction of the Committee in all matters connected with the welfare of the Society.

10.—That in the absence of the Secretary from any meeting of the Society, minutes of the proceedings be taken by a member of the Committee appointed by the President.

*Treasurer.*

11.—That the duties of the Treasurer be to collect all sums of money due to the Society; to receive all donations of money; and to disburse all sums payable by the Society out of the funds entrusted to him.

12.—That the Treasurer furnish half-yearly a detailed account of the receipts and disbursements to be audited by the Committee.

13.—That the funds of the Society be placed in the College Bank, and that no money be withdrawn by the Treasurer without the signature of the President to the order; or in his absence that of the Secretary.

*Librarian.*

14.—That the duties of the Librarian be to keep a Catalogue of the Library, with the names of the Donors; to see that the Library Regulations are carried into effect; to be responsible for the order of the Museum, and when necessary to assist the Secretary in the distribution of the Report of the Society.

*Library.*

15.—That any member of the Society be at liberty to consult any of the books belonging to the Society, but that only certain volumes, to be decided on by the Committee, be allowed to be taken from the room.

16.—That if any member wishes to take a volume from the Museum, he shall give his name, and the name of the book, to the Librarian, who shall enter them in the book kept for the purpose.

17.—That every volume so taken out be returned by the end of the quarter, but that no book be kept more than one month.

18.—That if any volume be damaged, such damage shall be reported by the Librarian to the Committee, who shall decide upon any further proceeding in the matter.

*Museum.*

19.—That any Member of a section, who is not a Member of the Society, be allowed access to the Museum at such times as it is open to Members of the Society generally, provided he first obtain leave from the President, which leave shall be renewed every quarter, but may be taken away at any time, if the privileges be abused in any manner.

20.—That the same privileges be extended, under the same conditions, to such other Members of the School who may wish to use the Library and Collections for the purpose of study, provided there be a reasonable excuse for their not belonging to a Section.

21.—That in all cases the Museum be used for the study of Natural History alone, and not as an ordinary Reading Room.

*Members.*

22.—That the election of new Members rest entirely with the Committee.

23.—That every Member pay a half-yearly subscription of 2*s.* 6*d.*, to be paid at the first meeting of the Society in that half-year.

24.—That if a member be elected at, or after the Quarter, he shall only pay 1*s.* on election.

25.—That Members have the right to be present, to state their opinions, and a vote at all general meetings of the Society; to introduce a visitor at general meetings of the Society; to have personal access to, and to introduce a visitor to the Museum; and to have a copy of the report half-yearly.

*Visitors.*

26.—That on such occasion when the number of those who wish to be present as Visitors at the general meetings of the Society is greater than the number of Members who attend, the President and Committee shall be empowered to admit two or more each, as shall seem fit.

*Honorary Members.*

27.—That Honorary Members have all the privileges of Members, except the power of introducing a Member of the School to the meetings of the Society.

*Suspension of Members.*

28.—That any member be liable to be excluded from the Society by the Committee, if, in their opinion, he shall have failed to show sufficient energy in the working of the Society.

*Sections.*

29.—That Sections be formed for the more accurate study of the different branches of Natural History, and that the Heads of these Sections be chosen by the Committee half-yearly from Members of the Society.

30.—That these Sections shall hold meetings as often as shall seem fit to the Heads of the several Sections, at which any member of the School, with the sanction of the Head of that Section, may attend.

*Meetings.*

31.—That ordinary meetings of the Society be held once a fortnight, but that the Secretary be empowered to call extraordinary meetings when necessary.

*New Rules.*

32.—That any Member of the Society have power to propose any new rule or any alteration in an old one, provided the motion be seconded by another Member.

## MEETING HELD SEPTEMBER 19TH, 1870.

This was a private meeting held for the purpose of electing a Member of the Committee and a Librarian in the place of E. Almack, who had left the School.

E. L. Heaketh was elected to the former, and G. H. Perry to the latter office.

The presentation of the transactions and proceedings of the New Zealand Institute by that Society, and of the Memoirs of the Geological Survey in ten Decades by Mrs. Preston, was announced.

W. C. Adams was elected a member of the Society.

There were present one Honorary Member, and 14 Members.

## MEETING HELD SEPTEMBER 23RD, 1870.

*Geology.*—H. J. Verrall exhibited specimens of 3 kinds of alabaster.

J. B. Fuller exhibited some gold quartz from Melbourne and some crystallized Limestone, Iron pyrites in chalk, and fossil pine-wood from Portland.

H. C. Spry presented a very fine specimen of iron pyrites and a specimen of variegated marble.

*Ornithology.*—H. C. Spry exhibited 2 curious varieties of bantam's eggs.

*Entomology.*—J. B. Fuller passed round a list of notices obtained during the holidays by C. M. Bull, Esq., also a box of beetles from Victoria and some curious insects' nests from Italy, presented by J. E. Ollivant, Esq.

*Archæology.*—G. J. Scott presented a silver Greek coin and a silver half-penny of Edward III and J. E. Ollivant, Esq., a portion of the Submarine telegraph cable laid between Tasmania and New Zealand. G. C. Mansel exhibited a portion of the sash of King Theodore.

*Library.*—G. H. Perry announced the donation of 8 parts of the Zoological proceedings of the Linnæan Society, by J. Britten, Esq., and of 2 parts of the botanical proceedings of the same Society by F. E. Hulme, Esq., F.L.S.

The President then read a paper on Entomology, written by H. M. Hilton, Esq.

It was determined that for the future Members should only admit 1 visitor each to the Society's meetings.

There were 36 persons present, 2 Honorary Members, 13 Members, and 21 visitors.

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## MEETING HELD OCTOBER 7TH, 1870.

THE minutes of the previous meeting were read and confirmed.

*Archæology.*—J. B. Fuller exhibited a collection of casts of medals and coins in the British Museum from the collection of the late Dr. Powell presented by C. E. Powell, Esq., and an American 2 dollar bank note, presented by M. H. Smith, Esq.

W. D. Fenning exhibited the first number of the 'College Lantern,' the first periodical printed at Salt Lake City, Utah, presented by J. E. Ollivant, Esq.

*Botany.*—The President exhibited some sections of betel nuts, presented by W. C. Adams, also some whole nuts from India and Siam, together with Shell Lime, Sipsiet, and leaves of Betel-Pepper, which are chewed with the nut; also two kinds of Carob Beans presented by J. E. Ollivant, Esq., and C. E. Powell, Esq.

*Entomology.*—J. B. Fuller passed round a list of captures obtained since August.

The President exhibited a Cicada and 2 scorpions from South Australia, presented by J. E. Ollivant, Esq.

*Geology.*—H. J. Verrall exhibited some of the minerals and fossils presented by C. E. Powell, Esq., and H. S. Sankey.

*Ornithology.*—E. L. Heaketh exhibited some of the birds and birds' eggs presented by C. E. Powell, Esq.

*Library.*—G. H. Perry announced the receipt of the usual periodicals, and of Lord Dufferin's 'Letters from High Latitudes' presented by M. H. Smith, Esq.

Special votes of thanks were passed to J. E. Ollivant, Esq., and C. E. Powell, Esq., for their liberal contributions to the Museum, several of which have yet to be exhibited.

F. E. Hulme, Esq., F.L.S., then read the following paper on

# MOSAIC, ANCIENT, MEDIÆVAL, AND MODERN.

Mosaic in its most extended sense may be understood to be the combination of minute portions of any substance into geometric, foliated, pictorial or other patterns, the pleasing result of the whole being produced by the aggregation of particles in themselves frequently of rough and irregular shapes; but the term as generally employed is taken in a more limited sense to imply the formation of such designs from the employment of various kinds of stone or marble, as porphyry, serpentine and others, and at a later period, the introduction of vitrified substances.

Mosaic has been employed from the remotest ages of which we have any knowledge, it is traceable to the most ancient periods of art, and seems to have arisen amongst the Eastern nations, races, which even to the present time shew a wonderful facility for intricate design and a fine sense of colour. We read incidentally in the book of Esther, in the description of the palace of Shushan, belonging to king Ahasuerus (who reigned about 500 B.C.,) of a pavement of red and blue and white and black marble, or according to the reading in the margin, of porphyry, and marble, and alabaster, and stone of blue colour. The Egyptians some 3000 years ago practised a curious kind of mosaic, wherein the pattern was produced by a number of very small rods of coloured opaque glass arranged perpendicularly to the surface of the design—so that if any number of sections were made horizontally through the glass each would have exactly the same pattern. The skill required is shewn not only in the design but in the minuteness of the workmanship, for some of the details can only be seen by the aid of a magnifying-glass, which no doubt was also used in the manufacture, though no example of a lens, so far as I am aware, has been found in the Egyptian remains. Layard discovered one while excavating at Nineveh, and there can be but little doubt that the Egyptians also were acquainted with its properties and use. Winckelman mentions two specimens

of this minute Egyptian mosaic work, one of which he says though not quite an inch in length and the third of an inch in breadth, exhibits on a dark ground a bird resembling a duck. The outline is bold and decided, the tints pure and beautiful in colour. The most delicate pencil of a miniature-painter could not have traced with greater sharpness the circle of the eye-ball or the feathers of the neck. The under side exhibits this same bird; it is impossible to discover any difference even in the smallest details, whence it may be concluded that the figure of the bird continues throughout the entire thickness. From the condition of this it was at first difficult to form any conception of the process of its manufacture, till a small fracture proved that filaments of the same colours as those on the surface of the glass passed right through from end to end. The other specimen, about equal in size to the former was also produced in the same way. It exhibits ornaments of a green, yellow and white on a ground of blue. All the details are perfectly distinct and though the keenest eye-sight is needed to trace some of the lines, they yet all pass faultlessly throughout the thickness of the piece and re-appear in fac-simile upon the reverse side. Mosaic pavements were, in the reign of the great Alexander, common throughout Greece, not only of a geometric character but also of more elaborate designs, figure-subjects, &c. Pliny in his writings refers to several eminent workers in mosaic. Mosaic work was introduced into Rome about 100 B.C., examples being brought amongst other spoils of war from Greece, and it was speedily adopted by the wealthier Romans in the decoration of their villas. As time passed on various modifications in the working arose, and as these have been classified by antiquaries I will just briefly run over them. *Opus tessellatum*, as it was termed, the most ancient kind, was composed of small cubes of marble varying from half an inch to an inch square, and formed into simple gometrical patterns, either curved as in the scroll and guilloche forms, or straight-lined frets and bands of colour. Many fine examples of this kind of mosaic are from time to time discovered in our own country, and may be seen in our leading metropolitan and provincial museums. The desirability however of greater variety of colour was speedily felt, and the *opus figlinum* was developed to meet this requirement, in this the small portions, technically called *tesseræ*, were formed of a combination of silex and alumina coloured by a metallic oxide. This soon became exclusively used, as from its greater variety of colour, the comparative ease in shaping the fragments required, and its cheapness compared to that which required marbles of more or less rarity for the production of its effects, the *opus tessellatum* was unable to compete with it; though many of the earlier pavements were admirably wrought out, and more especially when we consider the very limited means at the disposal of the artist; thus to give merely one example, a pavement found at Cirencester, representing the sea, with appropriate fishes, lobsters, crabs, star-fish, spiral

and bivalve shells, dragons and other marine monsters, was composed of the following few and simple elements,—the white produced by chalk; cream colour, by hard freestone; grey being produced by the same stone affected by heat; yellow, oolitic pebbles; chocolate, from the old red sand-stone; slate colour being lime-stone from the lower lias, while the light red, dark red and black were derived from the clays of the neighbourhood.

The *opus figlinum*, an improvement upon the *opus tessellatum*, had itself however in turn to give way to the *opus vermiculatum*, the most elaborate development of all, and which was limited to the direct representation of figures, animals and pictorial subjects generally, the effect being produced in its true colours and refinement of light and shade by the use of costly marbles, the vitreous oxide colours of the *opus figlinum* and in some few cases by the brilliancy of gems and precious stones. The immense difficulty of this will be understood when we bear in mind that all these gradations of colour must be produced by the laborious combination of minute fragments of these materials, requiring a selection and a blending together of great refinement and delicacy. Several very fine examples of this mosaic have been preserved, one perhaps of the most celebrated is that known as the Doves of the Capitol, found together with many other beautiful mosaics in the villa of Hadrian at Tivoli, see fig. 4. It was secured for the Capitoline museum by pope Clement XIII, and to give you some idea of the extreme minuteness of the pieces employed in its construction, in one square inch of it, one hundred and sixty distinct cubes of marble have been counted; this of course was a wall decoration, a picture in fact, or at least its Roman equivalent, not a pavement.

Another recognised variety of mosaic is the *opus incertum*, literally the uncertain or planless work, composed of all kinds of marble, irregular in shape and varied in colour put together in a kind of patchwork, and owing its effect not to any beauty of form but simply to the richness of its colour. Several examples of this as well as of the other classes have been found at Pompeii, in fact scarcely a building of any description has been uncovered there where a mosaic pavement of some kind has not been discovered. Pompeii, you will remember, was destroyed by an eruption of Mount Vesuvius, in the 79th year of the first century after Christ, though the art of working in mosaic seems to have attained to its highest excellence in the reign of the Emperor Hadrian, A.D. 117 to 138. Wherever Rome planted its victorious standards, as in Britain and Gaul, and wherever the influence of its higher civilization was felt, mosaic work is found. Our twelfth, thirteenth, and fifteenth illustrations are examples of this, number 12 being from Halicarnassus, in Asia Minor,

and the upper and lower ones from Carthage, and all from examples preserved in the British Museum.

You will bear in mind that from the nature and purposes of a diagram I am obliged to select such examples as from their simplicity and the largeness of their parts are easily visible. You must not, however, be led into the belief that these simple illustrations indicate the full scope of mosaic, since many of the ancient examples are very complex in their character and have a minuteness of detail that unfits them for our present purpose. The most ancient mosaic of Christian workmanship that has been found is probably that of Harkstow, in Lincolnshire, where, in combination with the more familiar Roman forms, is seen the sacred monogram and the symbolic fish-form. Passing on now to what we may more especially call the Christian period we find three distinct varieties of mosaic flourishing between the reigns of Constantine, A.D. 330, (who was, as I need scarcely tell you, the first Christian Emperor), and the fourteenth century. First, glass mosaic, or *opus musivum*, which was pictorial in character and used for the decoration of walls and roofs, and secondly, a glass tessellation (derived from *tessera*, which is itself derived from the Greek word for four, and signifying primarily a square block.) This is known as *opus Græcanicum*, the designs are conventional in the forms, and frequently used as an inlay in church furniture, episcopal chairs, pulpits, screens, &c. We see an example of this kind of mosaic in our first illustration.

The third and remaining variety is the *opus Alexandrinum*, a marble tessellation generally composed of porphyry, a reddish purple stone, and serpentine, a dull green, arranged into geometric patterns, that were cut into the white marble slabs which composed the ground work of the pavement. When in the year 329 the seat of empire was removed from the city of Rome to that of Byzantium, our modern Constantinople, the city of Constantine, the Roman workers in mosaic came under the eastern influence and exchanged the sobriety of effect of past efforts for the gorgeous colouring of the orientals. A leading characteristic of the *opus musivum* was the use of a golden ground to the objects represented. The pieces of glass used in this work are large and very irregular in shape, but the general effect is very imposing. Many beautiful examples of this may still be seen at St. Mark's, Venice, and other Italian Churches, and it is also to this day employed in the adornment of the churches of the Greek faith throughout Russia; the semi-circular apse at the end of the building and the domes and pointed roofs so characteristic of Byzantine architecture, being covered with figures of the Deity, of angels and archangels, saints and prophets, confessors and martyrs. Our Saviour and his followers are never represented as militant and sorrowing, the former things have

passed away, the eternal glory of Christ and of his chosen ones is alone represented, he is no more the homeless wanderer, the reviled, the crucified, but the Christ we read of in the grand language of the Apocalypse, whose voice is as the sound of many waters, and his countenance as the sun shining in his strength. "I am he that liveth and was dead, and behold I am alive for evermore." The effect of these mosaics, their brilliancy partly subdued by the dim light and the dust and stain of time, is very grand. How far such, with their accompanying elaborate ritual, grand architecture, noble music, &c., are in accordance with man's religious obligations, whether the simple building, unadorned in any way, is best adapted to pure worship, or that where men have freely given their noblest and best to adorn His Sanctuary, is a question which I am not now and here called upon to decide. Wherever the Byzantine influence has made itself felt, the figures are introduced with great rigidity of position and frequently attenuated to a degree out of all due proportion. It is curious that throughout the art of Christian Mosaic the profile or side-view of the face is, so far as I am aware, never shewn, the subject of the mosaic is always represented as directly facing the spectator. For nearly a thousand years, from the fourth century after Christ, till the revival of tempera painting in the schools of Cimabue and Giotto, mosaic was almost exclusively employed for wall decorations, and during at least four centuries, namely from the fifth to the ninth, entirely superseded all other methods, but for these mosaics therefore the course of pictorial art would have been broken, and though for their own inherent merits the loss would in most cases have been but small, as the execution was frequently coarse and the subjects ill-drawn, yet as links in the long chain of art, and as illustrations of the beliefs, doctrinal and legendary of the early ages of the Christian Church, they possess an extreme value akin to the touching memorials of the primitive Christians which so largely cover the walls of the long subterranean galleries of ancient Rome, the hiding places of the fugitives of the new religion from the fury of their persecutors. In Western art the figures were generally upon a white or blue ground, in Eastern, as we have already seen, upon a ground of gold. In the thirteenth century many of those whose names are famous as those of great painters, worked also in mosaic, thus Cimabue, primarily an artist in the more familiar sense of the word, directed the execution of a mosaic at Pisa, Giotto also, and many other celebrated Florentines, practised this branch of art. The workers in mosaic could not however compete with the great masters of fresco-painting, and having served its purpose well in the past, mosaic gave place to the new art, though it was still employed by the successive popes in the decoration of St. Peter's.

In the 17th century thin slips of enamel of various forms and sizes were introduced, and from the wonderful variety of colour then accessible to the

artist and the minuteness of the fragments employed, mosaic again rose into favour and was brought to great excellence. It was then employed to render an important service to art in the reproduction of the celebrated works of the great artists of the past, the finest pictures in the Vatican, many of them fading from the effects of time, being copied in mosaic for the Church of St. Peter. In this way frescoes of Raphaelle, Da Vinci, and other great masters, which were decaying through the dampness of the walls upon which they were painted, have been reproduced in a material which no length of time will have power to affect, and which may, so long as the fabric endures within which it is placed, be deemed imperishable; but, as may easily be credited, the labour and expenditure of time and money have been tremendous, some of the more elaborate subjects thus reproduced having been in hand eighteen to twenty years.

*Tarsia* work, or *Tarsiatura* was a kind of mosaic in wood, and we see at the present time a very humble imitation of it in the inlaid wood-work on fancy articles, known as Tunbridge ware. *Tarsia*, inlaid wood, either stained or of different natural colours, was at one time much used in decoration. It originated in Florence, but soon spread throughout Italy and France; in the latter country it was termed *Marquetrie*. In the 16th century Cologne was very famous for its inlaid tarsia work furniture. In the International Exhibition of 1851, a table of Spanish manufacture was exhibited, having a decoration upon it in this *tarsia* or marquetrie, three million pieces of wood it was stated being employed in its formation. *Buhl* work is another modification of the principle of mosaic. Buhl, an Italian, who was born 1642 and died 1732, settled in Paris during the reign of Louis XIVth; the work called after his name, and which at one time was in high repute was usually produced by an inlay of brass, generally scroll-work, in a ground of tortise-shell, while at the same time one Reisner, a German, who bore the appointment and title of *Ebiniste du Roi*, introduced a kind of work owing its effect to the introduction of ebony upon a ground of tulip-tree wood.

Neither of these two last methods of working possess any great intrinsic beauty, and only owe, or at least in great part owe, their popularity to their being patronised by the Court, and therefore by all those who desired to be thought fashionable, and being now just mentioned may be at once consigned to the same fate as the once popular but now well nigh forgotten manias for Dutch tulips, Cochin China fowls and such-like. It will of course be obvious to you that many such modifications and combinations might be formed and I will merely mention one other, the great use made throughout the middle ages, and more especially in Italy of a decoration upon chests and various articles of domestic furniture, musical instruments, &c., formed by small geometric patterns of ivory upon a dark ground. Examples of this are

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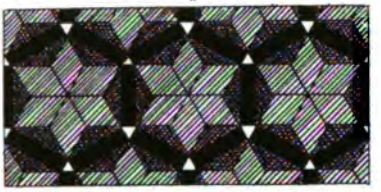

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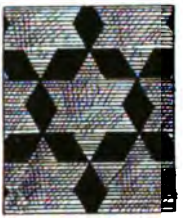

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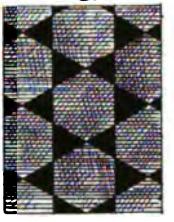

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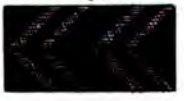

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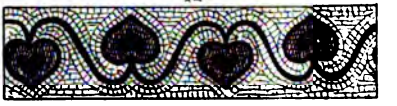

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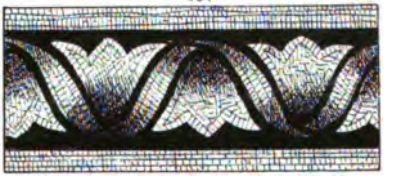

16.

17.

18.

19.

Photo Lithographed by Waterlow & Sons Limited

very numerous in the South Kensington Museum and our second and third illustrations shew us two such patterns from a Secretaire in *tarsiatura* of Italian workmanship dated 1550.

Parquetry, though very similar both in name and nature to Marquetry, differs from it in its greater simplicity, the natural wood being employed, and instead of any attempt at pictorial effect, such as groups of flowers or fruit as in the Marquetry inlay for furniture, altar decoration, &c., plain geometrical patterns are employed. Parquetry generally consists of thin pieces of richly grained or coloured woods upon blocks of a less expensive wood, it is largely used as a flooring in France and Austria, and is now also getting familiar to us in English homes. Our seventh and ninth illustrations, both taken from an Italian Cabinet of 15th century workmanship, in the South Kensington Museum; our eleventh, from a French Cabinet dated 1550 and preserved in the same valuable institution; the fourteenth, an Italian example; the eighteenth, from a Cabinet of Spanish workmanship; and the nineteenth from a Cassone of inlaid wood made at Pistoia during the 14th century, are all examples of this use of geometrical inlaid patterns as an element of decoration. The influence of geometrical forms upon design has at almost all periods been very marked; in some styles, such as the early English Gothic and Italian art of the 13th Century it is more conspicuous than in others, but in no style of ornament is it altogether absent. It is very interesting and remarkable to notice the universal adhesion to this principle, for whether we study the examples produced at the present day, or the remains of Egyptian and Assyrian ornament, the brainwork and handiwork of men who thought and toiled thousands of years before the Christian era, or whether we contrast the delicacy and refinement shewn in the productions of many of our leading English firms with the rude carvings or pottery of the Sandwich Islander or New Zealander, we still cannot fail to notice that amidst much that is very marked and distinctive in comparing one period with another, or the handiwork of one race or nation with another, this one great principle of the application of geometry to ornament stands prominently forward in them all. In endeavouring to search out the cause of this marked uniformity in the midst of much that is so diverse, one powerful motive I think we may fairly assume lies in the inherent beauty of a good geometric form, such for instance as the six-pointed star, (see fig. three,) formed upon the hexagon. It is often possible to produce great richness of effect by having the ground and figure of the same shape, the Moors, Arabs, and Hindoos delight more especially in this class of form: two good examples of it from the Moorish palace of the Alhambra in Granada are shewn in our sixth and tenth illustrations, the black and the white forms being in each case identical in shape. The mosques of Cairo afford many beautiful and curious examples of this,

some being of great richness and intricacy of design. In designs for tile-work, mosaic, oil-cloth or any kind of floor covering a sense of flatness is an essential quality, and here we find a great advantage in the use of geometrical forms, for the feeling of flatness is easily obtainable, and yet at the same time almost any degree of complexity and richness of effect. The early Italian churches afford us numerous excellent examples of the true use and beauty of geometric forms as employed in flooring or in surface decoration generally. Our two examples of what are termed by ornamentists, the "scale form" and "semi-quatrefoil" are taken from this source, our sixteenth example being from the baptistry, Florence; the seventeenth from the Church of Sta. Anastasia, Verona. Another great advantage lies in the great facility with which a design on a geometric basis can be put together, for the most elaborate and beautiful designs may be composed of but very few and simple elements, no. three for instance being composed entirely of hexagons and equilateral triangles, and no. eight a piece of Italian Marquetry of the 15th century, (which, by the way, is an example of a false principle, the fictitious effect of relief, where flatness is, as we have already seen, most desirable,) is composed of semi-hexagons of wood and of ivory alternately. Brevity is I feel very desirable, and as I have dealt with a subject extending from thirty centuries before our era to the present day, you will, I am sure, realise that I have been able to treat the subject in but the most sketchy way: should I, however, have awakened an interest in the minds of any of those whom I address, I would in conclusion refer you to the works, when you find opportunity, of Sir Digby Wyatt, Sir Gardiner Wilkinson, Gullick, Timbs, Labarte and others, to whom I also confess my own indebtedness for many facts which I trust have been of interest to my hearers as well as to myself.

## ILLUSTRATIONS TO PAPER.

1.—Glass tessellation. Sir Digby Wyatt's work on Mosaic.
2.—3.—Ivory inlay. Italian A.D. 1550, South Kensington Museum.
4.—Roman Mural Mosaic. Capitoline Museum, Rome.
5.—Roman floor Mosaic. Vatican Museum, Rome.
6.—Moorish tile-work. The Alhambra. Spain.
7.—From Italian cabinet, 15th Century. South Kensington Museum.
8.—Wood and ivory inlay, Italian 15th Century. South Kensington Museum.
9.—From Italian cabinet, 15th Century. South Kensington Museum.
10.—Moorish tile-work. The Alhambra. Spain.
11.—Wood inlay, French cabinet, circa 1550. South Kensington Museum.
12.—Greek Mosaic, Halicarnassus. British Museum.

12.—Mosaic border from Carthage. British Museum.

14.—Wood inlay, Italian cassone, 15th Century. South Kensington Museum.

15.—Mosaic border from Carthage. British Museum.

16.—From the Baptistery, Florence.

17.—From the Church of Santa Anastasia, Verona.

18.—From cabinet of Spanish manufacture, circa 1600. South Kensington Museum.

19.—From Italian chest, 14th Century work. South Kensington Museum.

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## MEETING HELD OCTOBER 21st, 1870.

The minutes of the previous meeting were read and confirmed.

*Archæology.*—W. D. Fenning exhibited a flint implement found in Savernake Forest, by W. C. Adams.

*Geology.*—H. J. Verrall exhibited three fossil teeth from Calne, presented by Rev. J. Sowerby.

These were also exhibited specimens of Copper and Malachite from S. Australia, Alabaster from Glamorganshire, Amethyst from Bavaria, and Galena from S. Wales presented by J. E. Ollivant, Esq.

*Ornithology.*—E. L. Hesketh exhibited some of the eggs and birds presented by C. E. Powell, Esq.

*Various.*—H. C. Spry presented two species of *Solen* from Exmouth.

The President exhibited specimens of Granite from Utah (of which the Mormon temple is built) and from the highest inhabited point in the world, between the Rocky and Black Mountains, and a lump of fused Bath Brick and tobacco pipes from the cargo of a burnt ship, presented by J. E. Ollivant, Esq.

The President also exhibited specimens of Peccary, Ant-eater and Opossum.

A. Babington, Esq. then read the following paper on

## SAVAGES.

When I was a very little boy, and commenced for the first time that study of History which we all of us prosecute with more or less success, I was profoundly impressed by a sentence which stood at the head of the first chapter, and which, if I remember rightly, ran as follows: "The ancient Britons were a race of savages who lived on roots and fishes and painted themselves blue." And I recollect feeling extremely disappointed (remember I was then very

young and very foolish) because the History said very little more about the lives and habits of those strange ancestors of mine, and went on to discourse of stupid wars and battles which I did not care twopence about.

Mindful of the impression produced upon me on that occasion, I have selected for the subject of my paper this evening, "Savages." And though I do not pretend to do much towards exhausting a subject so vast, yet I may perhaps be able to give you some new lights respecting a state of life which every nation in the world has, at one time or another, passed through.

But at starting it is necessary to clear the ground by a definition of this important word, "Savages." What do we mean when we talk of "Savages?" Now I suppose we have all of us more or less vague notions of what we mean by the word. We instantly form a notion of a man, who is more or less black, who wears neither shoes, stockings, or trowsers, who is very fond of knives and beads, who rows about in a canoe, who brandishes a spear, who has never seen a bath, a wash-hand stand, or a towel, and who on each and every occasion yells as loudly as we do at an exciting match. And this idea of ours would be tolerably exact. Yet it is possible to find some line which will divide even more accurately the savage from the civilised man; and I would say, therefore, though the words are somewhat long and somewhat hard, that the savage is the man who sets the physical above the moral and the intellectual, and the civilized man is he who sets the moral and the intellectual above the physical.

All definitions are proverbially unsatisfactory, and I do not expect mine to be any exception; but I will endeavour to make it intelligible by practical illustrations. And in order to do this more conveniently, I will this evening give you a slight sketch of one of the least barbarous and best known of savage tribes—the Kaffirs. Should my remarks prove sufficiently interesting to Members of the Society, we may at some future period examine others of the great divisions of savage races.

You have most of you, I suppose, heard of a Cape at the South of Africa called the Cape of Good Hope, which has become the seat of a prosperous English colony. It is to the north-east of the European settlement that the Kaffirs live; and from their proximity to the English settlers we know more about them than about any of the African savages. Indeed we were once engaged in a regular war with them, and I remember the time when I used to gloat over pictures of the Kaffir war as enthusiastically as you do now over pictures of Metz and Strasbourg.

First, let us say a few words about the Kaffir himself. Travellers almost universally allow that the finest specimens of the human form may be seen in Kaffir-land. It sounds perhaps absurd to compare black savages with the ancient Greeks, such chiefs as Dingan or Panda with such statesmen and

warriors as Alcibiades and Pericles. But in this respect the Kaffirs do not fall short of the countrymen of our old friend, Xenophon. And it is probably the mode of living which in both cases produces this result. We, civilized beings living in a civilized school, cannot give ourselves up to a purely physical existence. Latin Prose and Greek Grammar and Detention and Extra lessons, admirable things though they may be and unquestionably are, are not favourable to a perfect physical development. So, again, treacle bolly and ginger beer, and pickles, and jams, and slogs of cake, admirable things though they may be and unquestionably are, are not favourable to a perfect physical development. We do not always live in the open air, hence we catch cold as we move from one temperature to another: we wear shoes and stockings, hence we get our feet wet: we receive hampers from home, hence we sometimes get indigestion and sick headaches. Now in all these points the Kaffir has an enormous superiority. He lives constantly in the open air, he is continually taking the most violent exercise: he eats very sparingly: he is constantly undergoing the most severe privations: hence he never is ill, he never visits a sick-room or a surgery, and only dies at last of sheer old age. It is for this reason too that his powers of endurance are wonderful: a Kaffir will run forty or fifty miles at a stretch and think no more of it than we do of running up to the School field: he will go for days without food, and he will endure thirst for a length of time which would certainly kill any of us.

Secondly, let me attempt to give you some idea of the Kaffir's dress. The most important part of his wardrobe (odd though it may sound) is grease. All Kaffirs of all ages and both sexes are alike in this. Their skin being dark, they imagine that the glossiness which grease imparts to it adds to their beauty. But there is no doubt another reason for this unsavoury custom: the sun in Kaffirland is tremendously hot, and constant exposure to it would be very unhealthy were it not for this ointment. But to European noses the effect is very trying: an English traveller was once invited to a feast inside a Kaffir hut, and, to the astonishment of his hosts, he literally fainted away from the stench. But besides this, a Kaffir wears an apron round his middle made of strips of leather nailed to a broad belt, which he calls his tails. This, with a large necklace and a tuft of feathers on his head, completes his costume. His feet are altogether uncovered, and constant use has hardened the soles of them into a texture harder than any boot leather. So hard in fact do they become that a Kaffir will walk complacently over stones which would cut an Englishman's boots to pieces.

From this account of the Kaffir's dress it will be clear that an elaborate dress is a characteristic of civilised nations. Another characteristic of civilised nations is the elaborate character of their houses. We require a bedroom for sleeping in, a class-room for working in, a hall for dining in, a library for our

books, a wardrobe for our clothes. But a Kaffir lives so much in the open air that he has no need of anything except a sleeping apartment, and this is the only use to which he puts his hut. Outside, the hut looks like nothing so much as a beehive, with a small hole in the side by which they crawl in and out, and a small hole in the top to let the smoke escape. Being made of nothing but reeds and sticks plastered with mud, it affords no protection against attack, and a careless elephant has been known sometimes to put his foot through the roof. It is seldom, however, that a Kaffir's hut stands alone: they are generally grouped together in a small village which is surrounded by a stockade, and thus fenced in they are tolerably secure.

After dress and house, the next most important thing is food; on what does a Kaffir live? I have already said that his diet is very simple: indeed his staple food is maize or millet, which is carefully ground and boiled till it somewhat resembles the Scotch oatmeal porridge. To this may be added clotted milk and on rare occasions animal food. When such a treat does come in his way, the Kaffir avails himself of it to the full, and eats enough meat at a single sitting to last him for a week. But this happens very seldom; for the only domestic animal which the Kaffir keeps for food is the cow; and the cow is too valuable to be killed except for the most urgent reasons. Indeed though it may sound strange to us his cows constitute a Kaffir's whole wealth. He has no other possessions which he values or cares about. Till he has acquired cows he is unable to marry: according to the laws of his nation he must buy his wife, and cows are the only thing with which he can buy her. An eligible young lady will fetch about fourteen cows in the market: a plain one may be bought as cheap as three or four. Till he has acquired cows, he is unable to rise in the social scale, for the importance of a Kaffir is estimated by the number of cows. He may be clever, he may be strong, he may be an excellent hunter, an excellent soldier; but if he has no cows he is nobody. Should he, however, be fortunate enough to inherit or to obtain in war a stock of these indispensable animals, he is immediately taken notice of. All the match-making mammas set their caps at him, and all the chiefs admit him to their company till he becomes in process of time a chief himself. An amusing story is told of the importance which is attached to cows: during the Kaffir war a great chief in the course of an interview with some English officers anxiously enquired how many cows Queen Victoria had and was immensely puffed up with a sense of his own dignity when he learned that he was possessed of a far larger number than her Majesty.

Sometimes, however, the Kaffir if he be successful in his hunting obtains animal food other than that of cows, and this leads me to another branch of my subject, namely the occupations of the Kaffir. How does the Kaffir spend

his time when he is not eating or sleeping? Mainly in two ways—in hunting or in making war.

Hunting is the Kaffir's favourite employment, as it is with all nations who are still in a barbarous or semi-barbarous state. And the objects of the chase are chiefly three: antelopes, lions, and elephants. The antelope he prefers to hunt when it assembles in large herds, thereby he carries out a two-fold object; he ensures a more exciting chase to himself, and at the same time he kills a larger quantity of game. This he may do in two ways. First, there is the Hopo, which is in fact a large pitfall, dug out with great care and capable of holding a vast multitude of animals. From this pit two fences diverge shaped liked a capital V, the pit being the extremity of the V. These fences are about a mile in length, and their extremities are a mile or even more apart. Many hundred hunters then turn out, and sweep all the game from a large tract of country towards this open space. They then form a line across the top of the V and drive the game slowly towards the pit. It is not till they have reached the extremity that the antelopes become conscious of their danger, and then it is useless for the foremost to recoil, they are pushed onward by their comrades, and in a few minutes the pit is full of dead and dying bodies. The second plan is based on the same principle. South Africa is full of narrow and precipitous ravines, extending for some distance. One of the extremities and the two sides of these ravines are lined with hunters, each holding a sheaf of spears. Another band drive the game inwards as in the case of the Hopo, and close the other extremity behind them. As the terrified animals rush down the ravine they are struck by the spears of the hunters stationed along the sides, and on reaching the end are driven back by the hunters posted there. Thus they are hounded to and fro from one extremity to the other, till the hunters have exhausted all their weapons.

Lion hunting is more dangerous, but for that very reason more honourable. Generally a number of hunters post themselves at some distance from a lion's lair and by shouting and yelling drive him from it. As soon as he is driven into the open plain, one of the hunters provided (as they all are) with a spear the top of which is surmounted by a bunch of feathers, steps forward to attract the attention of the animal. At the same moment, all the other hunters hurl their spears at him; maddened with the pain the lion leaps forward at the foe in front of him; but the watchful Kaffir jumps nimbly aside, and plants his feather-topped spear in the spot he has just left. In his rage and pain the lion does not perceive the deception, and worries the spear which he imagines to be his enemy. As soon as he has found out the trick, he turns round and leaps on the nearest hunter who repeats the same process, each leap being accompanied by a shower of spears till at the length the mighty monarch succumbs beneath the repeated wounds.

But in point of importance hunting naturally ranks below war in the estimation of a Kaffir. To be distinguished as a soldier is the highest object of his ambition, and like Achilles of old he prefers a short life of glory with a bloody and violent end, to long years of inglorious ease. To us the Kaffir soldier is a most instructive object because he illustrates the definition which I laid down at the beginning of my remarks, viz., that the savage is wholly physical and absolutely unintellectual. Modern warfare as it has been waged in Europe for more than 200 years has been slowly becoming more and more intellectual. No amount of muscular strength in the infantry of an army is of any use unless the soldiers are well-armed and have got a good general. Science has been every year inventing better and better weapons, which have more or mere abolished all differences between the physical qualities of soldiers : so that now a days one weak man armed with a chassepot is worth five strong men armed with muzzle-leaders. And in proportion as the weapons of an army have become more perfect, so the value of good generalship has increased : the best general is no longer the strongest man in the army as in the days of Richard Cœur de Lion, but the man with the longest head. Now amongst a savage people like the Kaffirs all this is reversed. The best soldier is he who has the swiftest foot, or the strongest arm, or the quickest eye. And the fortune of war is decided by purely physical qualities.

The arms of a Kaffir are very rude and simple. His only defensive weapon is an ox-hide shield. His only offensive weapon is the spear of which I have already spoken. This spear is about five feet and a half long, and is wielded by the Kaffir with a dexterity which to an European seems absolutely marvellous, but which is very like the skill that our ancestors displayed in the use of the long bow. He generally goes to battle with eight or nine of these weapons, and as soon he comes within range of the foe hurls them one after the other with such rapidity that two or three are in the air at the same time. The last of his bundle he carefully reserves for the charge, when he snaps the shaft in half and uses the barbed end as as a dagger. The Kaffir is naturally brave, but even were he otherwise there is no doubt that he would fight courageously. For each battalion of the army has a captain assigned to it, whose chief office is to observe the conduct of his soldiers during the battle and report to the chief upon it. Anyone whom he points out as having flinched or shewn the white feather, is ordered out for instant execution.

As the Kaffir warrior often marches for days through a wild and uninhabited country, and takes no luggage with him, he is often in great straits for food. This difficulty he obviates in part as I have already mentioned by his capacity for eating an enormous quantity, so that when he does come across food he lays in a stock which will last him for some days, and looks with contempt on our feeble European stomachs which can only consume

enough for a few hours and require breakfast, dinner, tea, supper, and what not besides. There are times however, when even the much-enduring appetite of the Kaffir is severely tried and he then assists nature by a simple but ingenious contrivance: this is a "hunger-belt," *i.e.* a belt passed several times round the body and arranged so as to press upon the stomach and take away the faintness which accompanies long fasting. As the hours pass away and the faintness returns, the belt is drawn tighter and tighter, and thus the capacity for endurance is increased indefinitely.

There is one branch of my subject which, unpleasant though it be, I cannot pass by altogether in silence. I mean the superstition of the Kaffirs. Now the Kaffir as we have seen is altogether unintellectual and they are terribly ignorant and credulous; and it is well known that there is nothing which fosters superstition so much as ignorance. This superstition takes a form which it took in Europe for many years during the Dark Ages viz., a belief in witchcraft. I hope every one here has read Scott's "Ivanhoe," and, having read it, has not forgotten the scene where the Jewess Rebecca is found guilty of witchcraft. This scene is unhappily only too common in Kaffir land. A chief falls ill, and coming at once to the conclusion that his illness is the result of witchcraft, he straightway sends for a prophet to discover the wizard. This imaginary wizard is discovered by a process termed "smelling." A large circle of spectators is formed, all of whom sit upon the ground. When everything is ready, the prophet clothes himself in his full official costume and enters the circle. He then paces slowly round, gradually increasing his speed. Then comes the anxious part of the ceremony. The prophet leaps in great bounds around the circle, first rushing to one side and then to another, and drawing in his breath violently, like a dog trying to discover a lost scent. Each Kaffir sits in trembling awe, his heart sinking within him as he sees the terrible prophet advancing towards him, and his courage reviving as he turns off in another direction. At last the choice is made. The prophet stops suddenly opposite one portion of the circle and begins to sniff violently, as if trying to discover by the sense of smell who the offender may be. Suddenly he makes a dash forward, snatches his sword out of his belt, touches the doomed victim, and runs away.

The unhappy man is instantly seized by the executioners and hurried off before the chief in order to be examined. But this examination is really no examination at all, being simply a series of the severest tortures which human ingenuity can suggest. He is asked to confess that he has used witchcraft against his king, but invariably denies his guilt. Then torture after torture is inflicted upon him, long needles are run into his body, red hot stones are piled on his chest and at length a hole is made in one of the large nests of the

African ants, he is tied hand and foot and thrust into it, where in course of time he is stung to death by the angry insects Let us be thankful that our civilisation, if it does nothing else, preserves us at least from horrors like these.

One terrible story is told of the result of Kaffir superstition which is too striking to be passed over. In the year 1857 the Kaffir tribes organised a vast conspiracy for driving the white men out of Africa. A great meeting for this purpose was convened by an influential chief named Kreli, at which a celebrated prophet was expected to be present. He did not make his appearance but sent a messenger saying that the spirit had ordered the Kaffirs to kill all their cattle. This extraordinary command was obeyed by many of the people, but others in defiance of the injunction saved their cattle alive. Angry at this disobedience to his orders, the prophet called another meeting, and said that the disobedience of the people was the reason why the white men had not been driven out the land. But if they would be obedient and slay every head of cattle in the country, except one cow and one goat, the spirits of the dead would be propitiated and would give their assistance. Eight days were to be allowed for doing the murderous work, and on the eighth, at most on the ninth day, by means of spells thrown upon the surviving cow and goat the cattle would all come to life again and they would again repossess the wealth which they had freely offered. They were also ordered to throw away all corn in their granaries and their storehouses. As a sign that the prophecy would be fulfilled, the sun would not raise till half past 8, it would then turn red and go back on its course, and darkness, rain, thunder, and lightning, would warn the people of the events which were to follow.

The work of slaughter then began in earnest. The goats and cattle were exterminated throughout the country, and except the two which were to be kept in reserve, not a goat or a cow was left alive. The eighth day arrived and no signs were visible in the heaven. This did not disturb the Kaffirs very much as they relied on the promised ninth day. On that morning not a Kaffir left his hut, but sat in the doorway anxiously watching the sun. From six in the morning till ten they watched it, but it did not change colour nor alter its course and neither thunder, lightning, nor rain appeared to herald the fulfilment of the prophecy. The deluded Kaffirs then repented too late of their credulity. They had killed all their cattle and destroyed all their corn, and without these necessaries of life they knew they must starve. And starve they did. Famine set in throughout the country; the children died by hundreds; none but those of the strongest constitutions survived, and even these were skeletons worn away by privations.

If superstition is one characteristic of savage life, cruelty is another. I have already mentioned the custom of executing soldiers who have been

cowards in battle, but this is nothing more than is done in civilised countries a number of runaways were shot by the French only the other day. It is certain, however, that under some circumstances the Kaffir is altogether reckless of human suffering. A great Chief once ordered a detachment to catch a lion alive and bring it to him. As they were almost totally unarmed, having nothing but their shields and clubs, this commission was attended with no little danger. At last having provoked the lion to charge them, the bold warriors threw themselves upon him in such numbers that they fairly overwhelmed him and brought him bound and gagged without a single wound into the presence of the Chief. Of course several of the soldiers lost their lives in the assault: but this the king did not care about. More fearful however than anything else were the events which took place at the burial of the King's mother, Manda. Two days after her death she was placed in a large grave, and 12 of the girls of the nearest village were buried alive with her. It was then proposed that everyone should be killed who had not been present at the funeral; and this horrible suggestion was carried out, detachments of soldiers being sent through the country to execute it. Not satisfied even with this blood-thirsty scheme they devised a further refinement of cruelty. It was enacted that if any child was born during the year, both parents and child should be put to death. In this way hundreds of innocent lives were sacrificed.

I think I have now disposed of the most striking features of Kaffir life, but in conclusion I cannot forbear mentioning an amusing custom which prevails amongst them, and which will help to remove any painful impression left by my anecdotes of their superstition and cruelty. It is a point of etiquette which is rigidly observed, that no man may mention the name of his mother-in-law. This prohibition does not sound very formidable, but you must know that the Kaffirs are almost always called after physical objects: such as "cow, house, field, hill, river;" moreover every Kaffir is a polygamist and has half-a-dozen or more mothers-in-law. Imagine a rule existing here that you might not call any fellow in your Dormitory by name, and suppose that one fellow were called "bat," another "stumps," another "house-ground," another "football," another "jersey," another "extra-lesson," I think you would find it necessary to be rather careful in selecting your topic of conversation. But the most unlucky man is the king of the Kaffirs, for he rejoices in one thousand mothers-in-law, and I for one cannot conceive how he manages to carry on any conversation at all.

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R. W. Doyne was elected a Member and H. R. Armstrong and A. S. Marshall Hall was deprived of Membership for non-payment of subscriptions and for non-attendance.

There were 37 persons present, 3 Honorary Members, 18 Members, and 16 Visitors.

## MEETING HELD NOVEMBER 4TH, 1870.

The minutes of the previous meeting were read and confirmed.

*Geology.*—J. B. Fuller exhibited a series of fossil ferns from South Wales presented by J. E. Ollivant, Esq., also some coral from North Australia, recent sponges and different minerals from South Australia, and some nuts from a submersed forest near Hastings.

*Ornithology.*—E. L. Hesketh exhibited some more of the eggs and birds presented by C. E. Powell, Esq. The President exhibited a humming bird with nest and eggs presented by — Pughe, Esq.

The President exhibited the head of a saw-fish presented by E. C. Sewell, Esq., and a lemon with its seeds remarkably germinated.

H. J. Verrall then read a paper on "Coal and its uses."

C. E. Vaughan, J. P. Morgan, and C. P. Hooker were elected Members and J. F. Thomas a Medius Socius.

There 38 persons present, 4 Honorary Members, 20 Members, 1 Medius Socius, and 13 Visitors.

A private meeting was then held, when it was decided to have a Conversazione on or about the 25th inst., also that 'Nature,' 'Land and Water,' and 'Science Gossip,' should be taken in by the Society.

## MEETING HELD NOVEMBER 18TH, 1870.

The minutes of the previous meeting were read and confirmed.

*Archæology.*—W. D. Fenning exhibited a Bath Token found at Abury, also a silver penny of Henry IV found at Silbury, both presented by Mrs. Lye.

*Geology.*—J. B. Fuller exhibited some fossils and minerals from South Australia presented by J. E. Ollivant, Esq. C. P. Hooker exhibited a fine specimen of Nickel Pyrites presented by H. A. M. Power.

*Entomology.*—J. B. Fuller exhibited a long-horned beetle reared from a larva found in the leg of a walnut-wood piano, and also a specimen of wood bored by these larvæ.

W. C. Adams exhibited a specimen of sugar of milk presented by H. T. King.

B. J. Guillemard then read a paper on "A visit to Killarney" and W. D. Fenning the following paper, written by F. Madan, Esq., on

## WEATHER.

It is hard to conceive any one entirely without interest in the weather. So much of our lives is spent out of doors that we cannot escape being influenced to some extent by it: if we mean to *enjoy* ourselves in the open air, fair weather is necessary to that enjoyment; if our *business* takes us out, the weather necessarily either cheers or depresses us, and is never without its effect on us one way or the other. But to some the state of the weather is a subject of their most anxious thought; chiefly so to farmers, whose prosperity depends so much on good crops: and little less to sailors, whose ships may be driven out of their course, or stopped for weeks by storms or calms. And to come nearer to ourselves, the effect of what is called "regular Marlborough weather" is not unknown, and though on a fag-day we are not so much affected by it, and rather thank our stars that it has come on a fagday and not a half-holiday, yet when it *does* come on a half-holiday, cricket and even football may be entirely spoilt, if not stopped, by rain. We may be very thankful then that more rain falls by night than by day.

As on the occasion of my last paper, I have some doubts whether my subject comes within the present scope of the Natural History Society, but its President at any rate takes interest in meteorology, as Mr. Perkins' weekly periodical informs us: and there is no reason why those of us who have eyes should not be interested in the phenomena of what so much concerns our *pleasure*, if we have no more scientific motive.

As the *atmosphere* is the arena in which are fought all the battles of the winds, with which we have a good deal to do in talking of weather, and is the scene of all the changes in the condition of the air, we may well make it the basis of classification for this evening's paper.

First, then, I will try and describe what the atmosphere is, and what variations it is liable to.

Secondly, I will speak of its *Heat*.

Next, of its *Rain* and moisture.

Next, of its *Winds*.

And lastly, of what kind of predictions can be made of the weather.

First, then, common air, which is the chief element in the atmosphere, is a compound of oxygen and nitrogen, of which gases I know nothing, and has very perceptible weight: for a column of air stretching from the earth to the virtual top of the air weighs more than 14 pounds. And of this weight one-half is contributed by the first three and a half miles of air, although the air itself stretches fifty miles and more upwards, the reason being that the air near the earth is denser, and so heavier, from the weight of the air above it, just as the bottom of a football squash is somewhat denser than the top.

Now everything is composed of extremely small atoms, which, in the case of heavy things like stone, lie very close together, and in lighter things leave more space between them. And it is said that everything we know of is capable of three forms, the solid, the liquid, and the gaseous. Water is, as you have before now been told within this room, the most obvious example; ice, water, and steam being so familiar to us. But the point to be remarked is that, while things are in their solid and liquid state, their atoms attract each other and form masses of matter, but as soon as they become gaseous, repulsion takes the place of attraction, and the more the gas is confined and pressed together, the more force it exerts to resist the pressure and obtain freedom. Thus if a little water or ice be put in a box, it falls to the bottom, and only occupies a small part of the box, while if steam or any gas is put in it, it soon becomes equally diffused through the whole box, however little be put in. Now I will apply this to the atmosphere to explain some of its variations in weight.

It is almost invariably heat that turns a liquid into gas, and makes the gas itself exert a greater pressure when confined, if that heat be still continued. And it is the variations of heat in the atmosphere, which, by altering its condition as a gas, cause many of its variations in weight. To begin with one case, the heat, say of vertical rays of the sun, drives the atoms of air farther and farther from each other and makes them exert greater force when confined. But in the case of the air, the only side where it is not confined is the top, and accordingly the air at the hottest part of the earth rises and at last overflows into parts where the air is less heated, and so there is a less weight of air above the spot where the sun is highest and hottest than where the air is less heated. This is one variation in weight to which the atmosphere is liable.

Again, there is another variation from the invisible watery vapour which is always suspended in greater or less quantities between the atoms of air. Of this I will speak later on. And a curious fact is that dry air, that is, air which contains but little of this moisture or vapour, is heavier than moist air, the reason of this I cannot find in any of my books; because the presence of

the vapour would naturally cause some additional weight, or at least *not* cause lightness, as it does.

Again, the actual pressure of the air on the earth is lessened by wind: I suppose because the air presses obliquely on the earth and so is spread over more than if it pressed vertically: at any rate it is in exactly the same way that is possible to skate over ice which would not bear your weight standing still, provided you skate at a good pace, because your weight is distributed over a greater piece of ice in a given time, than if you were not moving.

These three are perhaps the chief causes of variation in the weight of the air.

I now come to speak more of the *heat* of the atmosphere.

Every day a great flood of heat is poured on the earth from the sun, more of course in summer than in winter: but a great part of this heat, and during half the year the *greater* part, is lost during the night. Now there are only three possible ways by which heat can be communicated from one substance to another, namely *conduction*, *convection*, and *radiation*.

Heat is communicated by *conduction*, when it passes from one particle to another without the particles themselves visibly moving, Thus if you heat one end of a metal bar in a fire, the heat gradually runs along the bar, and makes the cold end too hot to hold: yet the particles have not moved. In different substances the power of resisting the passage of the heat differs; those which allow it to run easily along are called good conductors; such are copper, and most metals; the others are bad conductors, such as glass. Now damp air is a much better conductor of heat than dry air, and so whatever heat passes from your body (and you must remember that the normal heat of the blood at the heart is 98 degrees, which is hotter than the sun's heat on what we should call a hot summer's day) whatever heat passes from the body passes more quickly on a damp day than on a dry one, and thus you feel cold on a damp day, since you lose more heat than usual from yourself, even though the air be warm. And everyone knows how much more cold and wretched he feels, when a thaw comes after a good frost, for even though the temperature has risen, the air is damper than during a frost, and so it *feels* colder than before.

Convection is different from this: instead of one particle communicating heat by *passing on* that heat to its neighbour, in convection, each particle *carries its own message* of heat, so to speak, and moves away, leaving its place to be supplied by some colder particle, to be in *its* turn heated. Thus every current, whether in the sea or the air carries heat by *convection*.

*Radiation* is an interchange of heat between bodies freely exposed to each other. If we stand before a fire, we feel its heat, although at some distance

from it. This cannot be conduction, for that can turn round corners, while, if you put a screen in front of the fire, you only feel the warmth of the air in the room: and it cannot be convection, for the current of air flows *towards* the fire and not *from* it: and this is what is called radiation. And every substance we know of possesses *some* heat, for we know of no substance so cold that it cannot be made colder and lose more of its heat: and therefore every substance is radiating heat to every other substance. Just in this way the earth is radiating heat all day and all night, but in the daytime the heat it receives from the sun usually far out-balances the heat it parts with itself: and so on the whole it increases in warmth, until the sun is so low that the heat the earth receives is less than that which it parts with, and from that time it becomes gradually colder. And thus it is that a good frost requires a clear sky, at least at *night*; we always speak of "*clear* frosty weather," for when there are clouds they act exactly like a blanket spread over the earth, by keeping in the heat which the earth is losing.

With *conduction* we have little to do in talking of the weather, but it is, thanks to the *convection* of heat from the tropics by the Gulf Stream, that our mean winter temperature is about 37° instead of 17°, that is, that instead of having severe frosts almost perpetually, such are the exception and not the rule. But it is with radiation that we have most to do, for the heat of the day and the cold of the night are both due to radiation, either from the sun or from the earth: and every change in the temperature of our bodies is due to the same cause.

I now come to speak of *Rain* and moisture in the air. As I have already said, there is always moisture or "aqueous vapour," as it is called, suspended invisibly in the air, in varying quantities: indeed, were it not for the resistance it offers to the passage of the sun's heat, we should be unable to exist for a single second by reason of the scorching heat of the sun. Now hot air can hold much more moisture between its atoms than cold air can, because the heat drives the atoms of the air away from each other, and leaves more space between to hold the moisture. And this fact is the whole cause of clouds and rain. For if we take some summer's day cloudless at the beginning, we shall see how it is that so frequently great clouds seem to gather in the sky towards the middle of the day, and disappear again towards evening. As soon as the sun's heat begins to be felt on the earth, the air near the earth is warmed and consequently rises, as hot air always does, charged with the "aqueous vapour." Now the higher it rises the colder the air is with which it meets, and so the atoms of the hot air are drawn together by the cold, and at last they come so close together that the moisture is pressed out and becomes visible as real cloud which we see in the air. And these clouds, which have real weight, are prevented from falling by the very up-currents which are forming them, which

buoy them up, and thus they stay till the sun's heat is in a great measure gone: then the up-currents cease, down fall the clouds gradually, until they reach warmer air near the earth, which has room for more vapour between its particles, and so they disappear little by little, being reabsorbed into their old condition of invisible aqueous vapour. Of course the air may be so dry to begin with that the little amount of moisture it has always finds room between the atoms of air, in spite of the cold: or a wind may prevent the up-currents.

But often the clouds themselves met with such cold air that they are still further condensed into drops of rain, and now have weight enough to fall through any upourrent: it is seldom, however, that rain is formed solely by these upourrents: the usual cause of the excessive condensation necessary for rain is found in a warm moist air meeting a cold one: then dense clouds are formed where they meet and heavy rain falls. Another cause of rain is high hills or mountain ranges: for a moist wind when it blows against these is forced by its own impetus up the slopes, and so is brought in contact with colder air at the top, and rain is formed which pours in deluges on the other side.

Mist and fog are simply clouds resting on the earth, and are formed in a similar manner by one warm substance meeting a much colder one: for instance, when a deep pond is colder or warmer than the air about it, mist is formed all over it, and so with river fogs.

Rain is the most capricious of all the elements of the weather: thus in the East of England, the rainfall is only about 25 inches annually, while in the West of England and in Ireland, it is about 35, and in the same districts, *if* in the immediate proximity of high hills, it is from 80 to 150 inches. And to go abroad, while in the Sahara Desert, the coast of Peru and some other places, rain rarely or never falls; in the Khasia Hills, N.W. of Calcutta, the rainfall is said to be 600 inches a year, or 50 feet! The rainiest spot in Great Britain is supposed to be a place in the Lake District, called "the Stye."

Snow is simply rain formed in the air at or below the freezing point, and is of such loose texture that it holds about ten times its own weight of air imprisoned between its crystals. These crystals are very minute, and when looked at separately appear of all the colours of the rainbow: and the reason that snow appears white is because all the colours are blended together. Red and green snow is met with now and then in the arctic and other regions, but its colour is due to the presence of microscopic organisms called *Protococcus nivalis*. It is curious that *just one half* of the globe is subject to snow-falls, for the limiting parallels for snow are at about the 30th degree of latitude, north and south.

*Sleet* is snow which has met with a warmer current on its way down, and which has partially melted and bound it more together, so as to form pure ice.

It is strange that but little is known for certain of the real nature of *Hail*. It is supposed to be rain frozen on its way down: but in summer, when hail chiefly falls, it is hard to imagine a stratum of air *below* the freezing point, sinking so low as to be *under* a current of rain-producing air.

We now come to the *Winds*.

Wind is air in motion and invariably flows from where the barometer is high to where it is low: that is to say, from where the air is heavy to where it is light. It is simply a tendency to restore the equilibrium of pressure: thus if the difference of weight in the air at two places not far from each other is great, the wind is violent: if the difference is little, or the places a great way off, the wind is gentle.

In England the wind we have most of is the S. W, which is in reality a true South wind, owing to the rotation of the earth, but it is hard to explain the reason clearly without a longer account than there is time to give. In the same way the N. E wind is a true North Wind. The S. W wind is nearly always *warm, moist and cloudy*, and if it meets with any cold wind and sometimes even when it does not meet one, very *rainy*. It is warm because it comes from the tropics, moist, because it comes over the Atlantic, from which it draws a large amount of moisture, and cloudy from being often overcharged with this moisture.

Most of our storms and strong winds come from the S. W. and we nearly get its full force here, as it comes down the valley of the Kennet, and blows full against A House and the Chapel. Drizzling rain and low driving clouds are its usual accompaniments, with an overcast sky above: still, we have to thank it for much of our warmth. This wind is called the Equatorial Current, because of its coming from the Equator and tropics.

The N. E. wind is as a rule *cold, dry and clear*—a complete contrast to the S. W. It is cold, because it comes from North Russia and the polar regions; dry, because it does not pass over any seas from which it could pick up moisture, and clear, because, in spite of its coldness, it usually has too little moisture to be condensed into cloud. It is a very unhealthy wind, indeed; though why its dryness makes it so, I do not know. It is most prevalent in spring, and causes the proverbially cold winds of March. It is called the Polar Current: and this and the Equatorial current are the only real steady winds that we can have. The others are all mixtures of these two, in one way or another, and are never steady and lasting.

It is because of the moist, light air of the S.W. wind, which makes the Barometer fall, that we talk of a fall in the Barometer foretelling bad weather: in the same way the rise of the Barometer is the sign of the presence of the Polar Current, which *generally* brings fine dry weather.

Now, as I had better risk making my paper too short than too long, I will

conclude by giving a few of the modes of predicting weather, so far as it is possible to do so without news from other meteorological stations about the weather there. A barometer is the most necessary instrument for this purpose. It falls for anything which makes the weight of air, which it balances, lighter: that is, for wind, which is so frequently accompanied by storms, for moisture and rain, and for warmth. And as the S.W. wind often combines all these qualities, the barometer sinks very low indeed for a strong S.W. wind. On the other hand, as it rises for calm, for dryness, and for cold air, a light N.E. wind makes the barometer rise to its highest point. Thus by consulting the rise and fall of the barometer we can tell what kind of current is above us, and so look for the weather which usually accompanies that wind.

But when the wind is S. E. or N. W. which are called "Transition" winds, because neither equatorial nor polar, if the barometer is unsteady, rain and unsettled weather is almost certain, because there is a battle of the winds going on, and sometimes one is gaining the ascendancy and sometimes the other and it only requires a *difference* of temperature to cause clouds and rain.

Our really fine weather usually means a light north-easterly breeze and cloudless sky, and that is the reason that a rise in the barometer is usually taken to be an indication of fine weather. But in certain cases a rise of the barometer with a northerly wind will betoken a heavy storm, so that the ordinary rule I have spoken of will not invariably be right.

Another thing worth knowing is that the winds in general go round the circle from W. to N. to E. to S., that is in the same direction as the hands of a watch, when you are looking down on it, and as the sun. I mean that when there is a west wind, the probabilities are in favour of its turning into a N.W. wind, and that into a N. wind, and so on. When the wind veers the other way, or from W. to S. to E. to N, it is said to be "backing" and unsettled weather usually follows.

I have not spoken of any of the instruments used in Meteorology: except that I have named the Barometer, because of the vastness of my subject. Even what I have said is much condensed, I only hope that the little you have heard will awake some attention to a subject so interesting as I have found Meteorology to be.

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There were 35 persons present, 2 Honorary Members, 17 Members, 1 Medius Socius and 15 Visitors.

# THE CONVERSAZIONE.

On the 25th November the Society gave their second Conversazione, in answer to frequent requests from visitors to the former one, and the success seemed to justify the experiment.

The Adderley Library was arranged much as before, though some improvements, suggested by past experience, were made; the principal alteration being the addition of the Lobby between the Adderley Library and the Common Room, which was carpeted and fitted up with tables for the better exhibition of objects of interest. The Bursar also kindly allowed his room to be fitted for the exhibition of Prints and Photographs.

In addition to the selections from the Society's collections, there were the following exhibitions:—

A magnificent collection of antique Chinese and Japanese articles, kindly lent by Messrs. Nixon and Rhodes (by the aid of Dr. Walker). Among the articles exhibited may be mentioned a magnificent Chinese presentation standard, of intricate workmanship, with over 6,000 signatures in gold letters on the back. Altar candlesticks, vases, and bowls, of Cloisonné and Champlevé enamel: Jade and Cornelian ornaments: curiously carved knives, forks, and spoons, of xvi century: and a series of ivory figures of Japanese workmanship. Some idea of the interest attaching to the collection may be gathered from the fact that the value of the articles was no less than £1,000.

A series of beautiful models of all the most interesting historical diamonds, some fine specimens of the interesting sponge called Venus' Flower Basket *(Euplectella speciosa)*, a collection of meteorites and meteoric stones, a very rich specimen of cinnabar, and a magnificent specimen of a fossil fern. Lent by Mr. J. R. Gregory.

A collection of flint implements found near Marlborough. Lent by S. B. Dixon, Esq.

A Russian obross. By Dr. Fergus.

Collections of coins. By C. M. Bull, Esq., and Rev. J. Sowerby.

Some Persian and Caucasian ornaments and Greek antiquities. By Mrs. Preston.

Collections of Photographs and Danish ornaments. By W. Mansell, Esq.

Inlaid sandal-wood bookstand and Brazilian Butterfly. By Rev. G. W. De Lisle.

Gyroscope. By J. B. Gilmore, Esq.

Peregrine Falcon and Tufted Duck. By R. E. Price, Esq.

Four cases of stuffed birds. By Mr. Grant, of Devizes.

And a collection of Brazilian insects. By the President.

As before, one of the great attractions was a set of microscopes and stereoscopes, hired from Mr. Ross.

At about 10 o'clock the company adjourned to the Hall, where a lecture was given by F. Storr, Esq., on Spectrum Analysis, the experiments in illustration of which were not very successful owing to unavoidable circumstances.

The College authorities kindly provided refreshments in the Common Room and supper in Hall, in the most liberal manner.

Notwithstanding this great help, the drain upon the Society's Funds would have been very considerable, had not the Members of the Common Room contributed most liberally to defray the cost incurred. For this and for the active and kindly interest displayed in rendering the conversazione a success the Society beg to tender them their very hearty thanks.

## MEETING HELD DEC. 16TH, 1870.

THE Minutes of the preceding meeting were read and confirmed.

*Archæology.*—W. D. Fenning exhibited a Queen Anne's farthing, presented by W. D. Lysons; and Mizaldus' "Hortus Medicus," A.D. 1546, presented by Mr. Rowe.

*Ornithology.*—The President exhibited a young specimen of a White Lark (*Alauda arvensis*), presented by Mr. Perkins; and E. L. Hesketh, a specimen of the Lesser Spotted Woodpecker (*Picus Minor*), caught in Savernake Forest.

*Entomology.*—J. B. Fuller exhibited two boxes of Indian moths and butterflies, presented by C. J. Lawrence, and a book on "Insects," presented by H. C. Spry.

*Geology.*—H. J. Verrall exhibited specimens of iron in its different stages of manufacture, presented by J. E. Ollivant, Esq.

*Library.*—G. H. Perry announced the donation of "British Bird's Eggs" by C. P. Hooker.

Westwood's "British Butterflies," by H. C. Spry.

"Illustrations of the Natural Orders of Plants," in two vols., by the authoress, Mrs. Elizabeth Twining.

Journal of the Linnean Society, by F. E. Hulme, Esq., F.L.S.

Also, Humphry's "British Coins," purchased by the Society.

*Various.*—J. B. Fuller exhibited some shells of echini.

W. D. Fenning some Bull-frogs from Jamaica, lent by Rev. J. Sowerby.

Some relics of Waterloo, presented by Mr. Leader.

A. C. Champneys then read a paper on the "Origin of Species."

J. F. Thomas was elected a member of the Society, and the President announced that J. B. Fuller had gained the Society's prize for an essay on a Natural History subject.

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After the departure of the visitors, E. Meyrick then proposed the following alteration in Rule IV and was seconded by A. C. Champneys:

"That those members of the Committee who are not ex-officio members be elected half-yearly and that the retiring members be eligible for re-election."

This motion will be discussed at the first meeting next half-year and voted for at the second.

There were 26 persons present: 1 Honorary Member, 17 Members, and 8 Visitors.

# ENTOMOLOGICAL NOTICES.

As the School returned this half so late in the year the list of Entomological notices must necessarily be a very short one. Great thanks, however, are due to the exertions of Mr. Bull during the absence of the School, without whose help we should hardly have had any list at all.

As usual, notices new to the locality are indicated by an asterisk (*).

## RHOPALOCERA.

| | | |
|---|---|---|
| Pieris Rapæ ... ... ... | Small White... ... ... ... | Nov. 4. |
| Hipparchia Semele ... ... | Grayling ... ... ... ... | Aug. 10. |
| Cynthia Cardui ... ... ... | Painted Lady ... ... ... | Aug. 10. |
| Vanessa Urticæ ... ... ... | Small Tortoise-shell ... ... | Nov. 10 (late). |
| V. Polychloros ... ... ... | Large Tortoise-shell ... ... | Aug. 9. |
| Thecla Quercus ... ... ... | Purple Hairstreak ... ... | Aug. 8. |
| Polyommatus Corydon ... | Chalk-hill Blue ... ... ... | Aug. 19. |
| P. Agestis ... ... ... ... | Brown Argus ... ... ... | Aug. 9. |

## HETEROCERA.

| | | |
|---|---|---|
| Smerinthus Tiliæ ... ... | Lime Hawk Moth (larva) ... | Aug. 8. |
| Sphinx Ligustri ... ... ... | Privet Hawk Moth (larva) .. | Aug. 8. |
| Hepialus Sylvinus ... ... | Wood Swift ... ... ... ... | Aug. 16. |
| Diloba Cœruleocephala ... | Figure of 8 ... ... ... ... | Sept. 24. |
| Dasychira Pudibunda ... | Pale Tussock (larva) ... .. | Aug. 10. |
| *Cybosia Mesomella ... ... | 4 Spot Footman ... ... ... | Aug. 8. |
| *Bryophila Glandifera ... ... ... ... ... ... ... ... | | Aug. 9. |
| Acronycta Rumicis ... ... ... ... ... ... ... ... ... | | Aug. 15. |
| Hydræcia Nictitans ... .. ... ... ... ... ... ... ... | | Aug. 13. |
| *Cerigo Cytherea... ... ... ... ... ... ... ... ... ... | | Aug. 9. |
| Luperina Testacea ... ... ... ... ... ... ... ... ... | | Aug. 10. |
| Rusina Tenebrosa ... ... ... ... ... ... ... ... ... | | Aug. 15. |
| Agrotis Segetum ... ... ... ... ... ... ... ... ... | | Aug. 13. |
| Triphæna Janthina ... ... ... ... ... ... ... ... ... | | Aug. 8. |
| Noctua Xanthographa... ... ... ... ... ... ... ... ... | | Aug. 15. |
| Anchocelis Pistacina ... ... ... ... ... ... ... ... ... | | Sept. 14. |
| A. Lunosa ... ... ... ... ... ... ... ... ... ... ... | | Sept. 18. |
| Dasycampa Rubiginea... ... ... ... ... ... .. ... ... | | Sept. 25. |
| Xanthia Flavago ... ... ... ... ... ... ... ... ... ... | | Sept. 21. |
| X. Ferruginea ... ... ... ... ... ... ... ... ... ... | | Sept. 17. |
| Miselia Oxyacanthæ ... ... ... ... ... ... ... ... ... | | Oct. 2. |
| Phlogophora Meticulosa ... | Angle Shades ... ... ... | Oct. 22. |

| | | |
|---|---|---|
| Gonoptera Libatrix ... ... | Herald ... ... ... ... ... | Aug. 8. |
| Amphipyra Pyramidea ... | Copper Underwing ... ... | Aug. 8. |
| A. Tragopogonis ... ... ... | Mouse ... ... ... ... ... | Aug. 8. |
| Mania Maura ... ... ... | Old Lady ... ... ... ... | Aug. 8. |
| Ennomos Erosaria ... ... ... ... ... ... ... ... ... | | Aug. 19. |
| Crocallis Elinguaria ... ... ... ... ... ... ... ... ... | | Sept. 18. |
| Hibernia Defoliaria ... ... ... ... ... ... ... ... ... | | Oct. 19. |
| Cidaria Miata ... ... ... ... ... ... ... ... ... ... | | Oct. 21. |
| Anaitis Plagiata ... ... ... ... ... ... ... ... ... ... | | Aug. 11. |
| Coremia Didymata ... ... ... ... ... ... ... ... ... | | Aug. 12. |

## BOTANICAL NOTICES.

The very unfavourable weather during the half-year prevented much Botanical work, and far fewer plants survived than is usually the case. The publication of the first part of the "Flora" renders it unadvisable to give any long report of notices: hence merely new Species and localities are given.

### NEW SPECIES.

| | |
|---|---|
| Epilobium tetragonum ... ... | Railway Bank, near the Marlborough Station. |
| Melilotus alba ... ... ... ... | Overton. |
| Senecio Sylvaticus ... ... ... | Long's Penning, Overton. |

### NEW LOCALITIES.

| | |
|---|---|
| Solidago Virgaurea ... ... | Copse near Granham Farm. |
| Phyteuma orbiculare ... ... | Silbury Hill. |
| Linaria spuria ... ... ... | Huish. |

# DONATIONS TO THE MUSEUM.

*Archæology.—*

Bath Token &c., by Mrs. Lye.

Lamp and Pavement from Pompeii, by A. S. Marshall-Hall.

Greek Coin and silver penny of Edward III, by G. J. Scott.

Farthing of Queen Anne, by D. C. W. Lysons.

Old Manuscript relating to Marlborough, by Mr. Neate.

*Botany.—*.

Collection of Plants from New Zealand, by J. E. Ollivant, Esq.

A large collection of British and Foreign Plants, by C. E. Powell, Esq., from the collection of the late Dr. Powell.

Collection of Plants by J. Britten, Esq., F.L.S.

*Entomology.—*

Beetles from Victoria and Insects' nests from Italy, by J. E.Ollivant, Esq.

*Geology and Mineralogy.—*

"Honeycomb Rock," from Monmouthshire by W. D. Steel.

Minerals from Cornwall, Switzerland and Norway, by A. S. Marshall-Hall.

Collections of Minerals, by H. C. Spry, J. E. Ollivant, Esq., and C. E. Powell, Esq.

Specimens of Iron in various stages of Manufacture, by J. E. Ollivant, Esq.

Three fossil teeth from Calne, by Rev. J. Sowerby.

Nickel Pyrites, by H. A. M. Power.

*Ornithology.—*

23 Brazilian Birds, by E. C. Sewell, Esq.

Collection of Eggs and Birds, by C. E. Powell, Esq.

Humming Bird, nest and eggs, by R. F. H. Pughe, Esq.

White Skylark, by Mr. C. Perkins.

"Bishop" Bird, by Mr. Baverstock.

*Various.—*

Piece of Telegraph cable laid between Tasmania and New Zealand, by J. E. Ollivant Esq.

Specimen of fused Bath Brick and Tobacco pipes, by J. E. Ollivant, Esq.

Casts of coins in the British Museum, by C. E. Powell, Esq.

American Bank Note and Cornish Diamond, by M. H. Smith, Esq.

Two species of *Solen* from Exmouth, by H. C. Spry.

Head of Sawfish, by E. C. Sewell, Esq.

Trophies from Waterloo, by Mr. Leader.

*Library.*—

Memoirs of the Geological Survey in 10 Decades, by Mrs. Preston.

Transactions and Proceedings of the New Zealand Institute by the Society.

Zoological Proceedings of the Linnæan Society, by J. Britten, Esq., F.L.S.

Botanical Proceedings of the same Society, by F. E. Hulme, Esq., F.L.S.

"Letters from High Latitudes," by M. H. Smith, Esq.

Westwood's "British Butterflies," by H. C. Spry.

Twining's "Illustrations of the Natural Orders of Plants," 2 vols., by the Authoress.

A Paper on the Superficial Deposits of the South of Hampshire and Isle of Wight, by T. Codrington, Esq., F.G.S.

"The Student" and "Popular Science Review," by the Rev. J. M. Fuller.

## ACCOUNTS.

| RECEIVED. | £ | s. | d. |
|---|---|---|---|
| Balance in hand ... ... | 19 | 0 | 4 |
| Compositions ... ... ... | 2 | 2 | 0 |
| Subscriptions ... ... ... | 6 | 4 | 0 |
| Arrears ... ... ... ... | 0 | 17 | 6 |
| Donations ... ... ... ... | 17 | 18 | 10 |
| Sale of Back Reports ... | 0 | 7 | 0 |
| Sale of Report for Mids. ... | 37 | 16 | 0 |
| | £84 | 5 | 8 |

| PAID. | £ | s. | d. |
|---|---|---|---|
| Museum expenses ... ... | 6 | 12 | 9 |
| Plates for Report, Mid-summer, 1870 ... ... | 1 | 5 | 9 |
| Printing Report Mid-summer, 1870 ... ... | 34 | 4 | 6 |
| Printing Account ... ... | 2 | 10 | 0 |
| Tracing Map of Preshute | 1 | 0 | 0 |
| Conversazione... ... ... | 17 | 16 | 6 |
| Books and Binding ... | 2 | 2 | 1 |
| Hillier's Account ... ... | 1 | 9 | 6 |
| Postage ... ... ... ... | 0 | 3 | 8 |
| Balance in Hand ... ... | 17 | 0 | 11 |
| | £84 | 5 | 8 |

## DONATIONS TO THE FUNDS OF THE SOCIETY.

| | £ | s. | d. |
|---|---|---|---|
| Rev. J. Sowerby ... ... ... ... ... ... ... | 1 | 10 | 0 |
| Rev. T. A. Preston ... ... ... ... ... ... | 2 | 0 | 0 |
| R. Hunter, Esq. ... ... ... ... ... ... ... | 1 | 10 | 0 |
| F. Storr, Esq. ... ... ... ... ... ... ... | 1 | 0 | 0 |
| Rev. G. W. de Lisle ... ... ... ... ... ... | 1 | 0 | 0 |
| J. B. Gilmore, Esq. ... ... ... ... .. ... | 1 | 0 | 0 |
| A. Babington, Esq. ... ... ... ... ... ... | 1 | 0 | 0 |
| C. W. Bourne, Esq. ... ... ... ... ... ... | 1 | 0 | 0 |
| W. E. Mullins, Esq. ... ... ... ... ... ... | 1 | 0 | 0 |
| C. R. Carr, Esq. ... ... ... ... ... ... ... | 1 | 0 | 0 |
| Rev. H. Bell ... ... ... ... ... ... ... | 1 | 0 | 0 |
| Rev. G. G. Bradley ... ... ... ... ... ... | 0 | 11 | 0 |
| Mr. Stubbs ... ... ... ... ... ... ... ... | 0 | 10 | 6 |
| D. E. Leighton, Esq. ... ... ... ... ... ... | 0 | 10 | 0 |
| A. H. Beesly, Esq. ... ... ... ... ... ... | 0 | 10 | 0 |
| W. Mansell, Esq. ... ... ... ... ... ... ... | 0 | 10 | 0 |
| C. Sankey, Esq. ... ... ... ... ... ... ... | 0 | 10 | 0 |
| E. W. M. Lloyd, Esq.... ... ... ... ... ... | 0 | 10 | 0 |
| Rev. C. E. Thorpe ... ... ... ... ... ... | 0 | 10 | 0 |
| H. B. Horner, Esq. ... ... ... ... ... ... | 0 | 10 | 0 |
| A. Armstrong, Esq. ... ... ... ... ... ... | 0 | 2 | 6 |
| C. A. Sladen, Esq. ... ... ... ... ... ... | 0 | 2 | 6 |
| Mrs. Royce ... ... ... ... ... ... ... ... | 0 | 2 | 4 |
| | £17 | 18 | 10 |

## REPORTS.

NUMBER PRINTED 500

| | |
|---|---|
| Honorary Members ... ... ... ... | 43 |
| Members ... ... ... ... ... ... ... | 15 |
| Donors, &c. ... ... ... ... ... ... | 34 |
| Sold ... ... ... ... ... ... ... ... | 252 |
| On hand ... ... ... ... ... ... ... | 156 |
| | 500 |

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# ON THE IDENTIFICATION OF BIRDS' EGGS.

*PRIZE ESSAY, BY J. B. FULLER.*

It may seem but presumption on my part to attempt a new method of identifying birds' eggs, (hitherto so difficult for the unscientific school-boy,) when so many excellent books have been written on this subject.

This method is as unscientific a one as could be adopted, therefore is meant only as a help to identifying eggs not for any purposes of classification. Books on this subject are of two sorts, those which treat of the eggs, as ought always to be done, in connection with the birds to which the eggs belong, and those treating of them as an independent subject; nevertheless, in books of this sort, I believe, the eggs are always arranged for identification, not so much with regard to their own peculiarities, as with regard to those of the birds that laid them. This succeeds very well with a scientific collector whose collection of eggs is considered merely as supplementary to a collection of the birds themselves, which of course form a much higher subject for study. In a book however devoted exclusively to eggs, I think to the unscientific it would afford much greater facility in naming them, if they were arranged for that purpose by their own differences, not by those of the birds. For though it is true that in most cases the bird-classification answers very well for eggs, yet in some cases eggs laid by the same family of birds are totally dissimilar; for instance, I think that no one, seeing the pink spotted swallow's egg, and the pure white egg of the house martin together, would think that they belong to the same family of birds.

But it must be remembered that this perfectly arbitrary arrangement of eggs by their size and colour must only be referred to in connection with the proper classification of the birds themselves.

The classification and nomenclature I have adopted are those used in F. im Thurn's "Birds of Marlborough," a book of the greatest importance as a help to the ornithologist with regard to the localities and seasons of the birds round Marlborough. To attempt to explain and give reasons for the beautiful colour and varied tints of eggs, or for the differences in their shape, I regard as quite as hopeless a matter as to try to account for the hue of every flower that ornaments our woodlands.

Doubtless some eggs are fitted by their colour for concealment, as for instance, the eggs of the partridge, which so exactly resemble in colour the waste ground on which they are laid, that it is with difficulty that they are seen, though one approaches quite near to the nest, if the rude hollow in which they are laid may be termed such. This rule, I think, more particularly holds good with eggs laid on the ground, and therefore more exposed.

Again I have heard that eggs laid in holes, whether in tree or ground, are generally pure white. This rule certainly holds good in many cases, as in the Owl family, nearly all of which lay their eggs in holes, but I think that the cases of deviation from the rule are as numerous as those which actually follow it. The Wheatear, for instance, which makes its nest deep down in rabbit burrows, has eggs of a beautiful blue colour, so has the Red-start, which makes its pretty little nest of moss and horse hair in holes in trees. The eggs of tits too, though it is true that their ground colour is white, are beautifully variegated with pink spots.

It is then of little or no use to endeavour to explain and give satisfactory reasons for the different hues of birds' eggs, as instances of the wonderful works of the Creator, to be seen even in the smallest and seemingly most insignificant objects.

As regards the situations of different birds' nests, they vary from the topmost bough of the lofty beech tree, where the hawks and crows build their rude structure of sticks, to the ground, where the Wild Ducks and Moor-hens make their loose and incompact nests of marshy reeds.

In all nests on the ground I think that it happens more often than in nests situated elsewhere, that there are one or more addled eggs, which may be probably attributed to the damp which rises from the earth and to a certain degree must of course counteract the warmth of the sitting hen. For instance, out of three Wheatears' nests all containing young birds, one contained two eggs, the other two, one egg each, addled.

In the manner of building nests, there is quite as much variety as there is in their position. Some nests, as of the Wood-pigeon, are really nothing more than a thin platform of twigs, so thin indeed that the eggs can often be seen through from below the nest. Other birds still build their nest of sticks, but make the platform thicker and hollow it in the middle, lining it with roots or hay. Then we come to the grass nests of the blackbird and thrush, and other similar birds which generally strengthen their nests with mud. Lastly through different gradations of nests, each becoming more compact and highly furnished we come to the beautiful domed nest of the Longtailed Tit, and the scarcely inferior nests of the Goldfinch and Chaffinch.

As regards bird's-nesting I think that it is a perfectly harmless and instructive amusement, provided that the impulse to it be not merely the love

of finding and amassing huge numbers of birds' eggs, nearly all of which are of the same common species, and it be conducted without cruelty to the feathered owners of the nests. If only one or two eggs be removed, and the nest be not otherwise rudely handled or disturbed, we have every reason to believe that no pain is inflicted on the parent birds. But it is inexcusable cruelty if the nest itself be taken or destroyed and all the eggs removed as beyond all doubt birds feel being deprived of their offspring, as indeed eggs may be termed, as keenly, or at all events very nearly so, as animals of a higher class. But it is impossible that a real lover of Natural History could commit an action so cruel as this.

I have only attempted to describe the eggs of those birds which actually are found near Marlborough, or of those which may be reasonably expected to occur in its vicinity.

It must also be remembered that the lengths of eggs, when given, are not meant as any characteristics, as eggs vary considerably in size, but they may be of some use, as being taken from the most common varieties, in deciding between the eggs of two species, which in all other respects may be similar, and also in determining the relative size of an egg with regard to that of any other species of bird.

## TABULAR VIEW OF SYSTEM OF ARRANGEMENT.

### UNSPOTTED EGGS.

**White Eggs.**

One inch and over in length.

Nos. 1—10.

Under one inch length.

Nos. 11—14.

**Blue Eggs.**

One inch and over in length.

Nos. 15, 16.

Under one inch in length.

Nos. 17, 18.

**Brown Eggs.**

One inch and over in length.

Nos. 19—21.

Under one inch in length.

No. 22.

### SPOTTED EGGS.

**Ground-colour, White.**

Spots, Pink.

Nos. 23—34.

Spots, Reddish brown.

Nos. 35—37.

Spots, Purplish brown prolonged into streaks.

Nos. 38—40.

Spotted or blotched with *two* shades of grey or brown.

Nos. 41—48.

Ground colour, Blue or bluish green.

Spots, Purplish pink.

Nos. 49—52.

Spots, Rust-red.

No. 53.

Spots, Light brown.

Nos. 54—56.

Spots, Black.

Nos. 57, 58.

Spots or *blotches*, Brown.

Nos. 59—63.

Ground colour, Brown.

Spots, a darker shade of ground colour.

Nos. 64—68.

Ground colour, Greenish grey.

Spots, a darker shade of same.

Nos. 69—71.

Ground colour, Reddish brown.

Spots, darker shade of same.

No. 72.

Ground colour, Dark grey.

Spots, darker shade of same.

No. 73.

Ground colour, Pale yellowish brown.

Spots, darker shade of same.

No. 74.

Ground colour, variable, *orange* or *green*.

Spots, darker of ground colour in each case.

No. 75.

UNSPOTTED EGGS.

*White Eggs.*

Eggs 1 inch and over in length.

1.—*Otus vulgaris*. (Long-eared Owl).

The eggs of this species are about 1½ inches long and almost round. They are rough and altogether lack the shining lustre of those of the Pigeon and

Woodpecker tribes, as indeed do the eggs of all the Owl family. The birds generally lay their eggs in deserted crows' nests at the top of tall fir trees, preferring woods where the fir trees grow closest together. It occurs frequently in Rockley, also once or twice at Martinsell.

2.—*Syrnium stridula.* (Tawny Owl).

The eggs are very round in shape, but considerably exceed in size the eggs of the former species, being from 1¾ to 2 inches long. The eggs are laid in some hole, whether in tree or deserted building, on the bare earth, or rock, without the pretence of any nest whatever, as far as I have been able to find out.

3.—*Strix flammea.* (Barn, White, or Yellow Owl).

Eggs of the same length as those of *O. vulgaris* but much thinner in shape, differing in this respect from nearly all other Owls' eggs. They are laid generally in holes or in dark corners in hollow trees, barns, or even church steeples. It is by far the commonest of the Owl tribe and does inestimable good to the farmer by destroying quantities of mice, which would otherwise be eating up and spoiling his grain, and it is but too frequently repaid by being shot and nailed up to the barn door as the worst of vermin.

4.—*Picus viridis.* (Green Woodpecker).

Eggs 1¼ in. long, shining, when unblown tinged with a pinkish hue and covered with lighter lines. They are laid in a hole in a tree, excavated by the bird and without any nest, unless the soft chips of rotten wood lining the bottom of the hole may be termed such.

In Savernake Forest I have noticed that by far the greater number of nests are made under the over-hanging bough of a birch tree.

5.—*Cypselus apus.* (Common Swift).

Eggs 1 in. long, rough, but not so much so as is seen in the eggs of the Owl family. They are very long in comparison with their breadth. The nest is generally made in a hole in thatch or under the eaves of a thatched roof.

6.—*Columba palumbus.*—(Ring Dove or Wood-pigeon).

Eggs 1½ in. long and beautifully glossy. They differ from those of the next species (Stock-dove) in being a trifle longer and thinner. The nest is merely a very thin and irregular platform of twigs. Occasionally, however, the nest is made much thicker and sometimes is even lined with materials a little finer than those of which the nest is mainly composed.

7.—*Columba œnas.* (Stock-dove).

The eggs of this species are much rounder than those of the preceding, otherwise they are quite similar. The nest differs from the Woodpigeon's in being always made in holes or clefts in trees; it is, like it, however only com-

posed of a few twigs. I remember once finding in a very thick old beech tree about 12 nests of this bird, one above the other, and in the uppermost one two eggs. Evidently the tree must have been bred in for many years.

8.—*Columba turtur.* (Turtle dove).

Eggs 1¼ in. long. They are the smallest British dove's eggs. The nest is very thin and fragile, generally composed of a few roots interwoven so as to form a thin platform.

9.—*Podiceps minor.* (Dabchick or Little Grebe).

Eggs 1¼ in. long, *very pointed* at the small end, not so glossy as those of the Doves. When first laid they are pure white, but the specimens generally obtained are so stained with mud that they are of a dirty brown colour. The nest is merely a lump of water-weed and mud; the eggs are generally covered up when the parent bird leaves the nest.

10.—*Cinclus aquaticus.* (Dipper).

Eggs 1 in. long, generally deposited in a mossy nest in a hole near the water-side. The nest of this bird has never yet to my knowledge been taken near Marlborough; but it is a species that may very probably occur now and then on the banks of the Kennet.

Eggs under 1 inch in length.

11.—*Alcedo ispida.* (Kingfisher).

Eggs round, semi-transparent, and beautifully glossy. On some specimens I have seen there has been a very pale purplish spot. The eggs are laid in a hollow on the bare earth at the end of a hole about one or two feet long, often considerably longer. The kingfisher generally disgorges the bones of the fish on which it feeds, in its hole, and therefore it has been erroneously stated that the kingfisher makes its nest of fish bones.

The hole is generally in a river bank, but sometimes in a bank some little distance from any water. One I found on the White Horse Hill was quite 300 yards from the river.

12.—*Hirundo urbica.* (House Martin).

Eggs rather longer, but nevertheless narrower, than those of the next species. They are laid in a domed mud-nest lined with feathers, *generally* built under the eaves of a house.

Very frequently in the absence of the old birds the nest is seized and the eggs turned out by some impudent house sparrow, who builds its own nest inside that of the martins. When the real owners of the nest return they generally make the best of it and set to work to build another nest, if however they try to turn the invader out they are generally worsted and driven off by him.

13.—*Hirundo riparia.* (Sand Martin).

Eggs a trifle shorter than those of the preceding. The nest is made of straw and feathers at the extremity of a burrow, often a yard long, excavated by the old birds in a sand bank.

14.—*Yunx torquilla.* (Wryneck).

The eggs of this species are laid on some rotten wood in a hole in a tree. I have never had the good fortune to see a nest, but I believe that one was found in the "Wilderness," at the College, some years ago.

*Blue Eggs.*

Eggs 1 inch and over in length.

15.—*Ardea cinerea.* (Heron).

Eggs 2¼ inches long, of a light greenish blue colour. The large nest is made in the tops of the highest trees. There are Heronries in the vicinity of Marlborough, at Bowood and also at Bedwyn.

16.—*Sturnus vulgaris.* (Starling).

The eggs, 1 inch long, are of a light blue colour and are laid in a rough straw nest in almost any hole that the parent birds can meet with, whether in tree, thatch, or building.

Eggs under 1 inch in length.

17.—*Accentor modularis.* (Hedge Sparrow).

Eggs of a beautiful blue tint, darker than those of the Redstart, they are also a little rougher and also a trifle longer *as a rule.* The pretty little nest is made of moss lined with horse-hair and a little sheep's wool. It is generally placed in a fork in a thick quickset hedge.

18.—*Phœnicura ruticilla.* (Redstart).

The eggs of this species differ from those of the former in being more glossy, of a paler tint, and in having a much thinner shell, so thin and transparent indeed that when fresh and unblown the circular edge of the internal skin can be plainly seen through the blunt end of the egg. The nest is built in holes or clefts in trees, and is made of moss lined with rabbit's fur.

*Brown Eggs.*

Eggs 1 inch and over in length.

19.—*Phasianus Colchicus.* (Pheasant).

Eggs 1¾ inches long, light brown, often, when unblown and fresh, with a few dark blotches. The nest is situated on the ground, often composed merely of a few bits of grass or straw, and once I saw the eggs laid on the bare earth in a hole at the foot of a tree.

20.—*Perdix cinerea.* (Partridge).

Eggs 1¼ inch long. Except in being half an inch shorter, the eggs of this bird exactly resemble those of the Pheasant; a few more materials too are used in the construction of the nest of this than in that of the preceding species.

21.—*Anas boschas.* (Wild Duck).

Eggs 2 inches long, of a *very pale* greenish brown colour, sometimes almost white. The nest, of dried water flags, is generally made on the ground in water meadows, sometimes it is in more elevated situations as in low trees.

Eggs under 1 inch in length.

22.—*Philomela luscinia.* (Nightingale).

The eggs of this species are of a *very dark* olive brown. The nest is situated on the ground in tufts of grass or in some similarly sheltered position. It is very deep, made of fine grass, and surrounded with a bed of oak leaves. The bird occurs in Rabley Copse, where I once saw a nest in which the old bird had been caught and destroyed by a Stoat or Weasel, as could plainly be seen from the quantities of feathers strewing the ground round the nest.

SPOTTED EGGS.

*Ground colour, White.*
*Spots, Pink.*

23.—*Salicaria locustella.* (Grasshopper Warbler).

The white ground colour of these eggs has a faint pink tinge about it, especially before the egg is blown. They are, as a rule, almost covered with very small brownish pink spots, but specimens are often met with, that have the spots themselves a little larger and collected towards the larger end. The only distinguishing mark between this latter variety and the eggs of the Tree-creeper (*C. familiaris*) is that the eggs of the Grasshopper Warbler are a trifle the larger of the two. The nest, a very thin and fragile structure, is built on or very near the ground in the centre of a high tuft of grass, or at the foot of a small bush surrounded by herbage.

24.—*Sylvia rufa.* (Chiff-chaff).

The spots of a purplish red, but *not so dark* as those on the eggs of the next species; generally the spots are much fewer in number. This bird like the next two species builds a domed nest of hay lined with feathers, on the ground, but cleverly concealed in a tuft of grass.

25.—*Sylvia sylvicola.* (Wood Warbler).

The spots on the egg of this bird are more in number and of a darker tint than on those of the former species. Sometimes the egg is almost covered with the dark, purplish, spots. Its nest almost exactly resembles that of the Chiff-chaff and is built in similar situations.

26.—*Sylvia trochilus.* (Willow Warbler).

The eggs of this bird are of two varieties, one, in which the egg is almost covered with a quantity of *light red* speckles, the other in which the spots are very much fewer in number and very much larger.

This is the commonest of the Warblers and its pretty little domed nest may be frequently found hid under a bunch of fern or in a tall tuft of grass. In some nests I have seen, there has been a feather hanging over the orifice so as to act as a kind of door. I have also noticed this in many nests of the Long-tailed Tit *(P. caudatus).*

27.—*Parus major.* (Greater Tit or Ox-eye).

Eggs with a pure white ground colour, and somewhat sparely mottled with largish and irregularly shaped pink spots, especially towards the larger end. The nest is made of rabbit's hair and placed at the bottom of a hole, which I have never yet found to have been made by the parent birds, although it is sometimes stated that such is the case.

28.—*Parus cæruleus.* (Blue or Lesser Tit).

Eggs smaller than those of the last species. The spots also are much more numerous and are a good deal smaller.

With respect to the nest and its position it exactly resembles that of the Greater Tit.

29.—*Parus ater.* (Cole Tit).

Eggs between those of the Greater and Blue Tits in size; rounder and generally with only a few spots near the larger end. These spots are not so large as on those of the Greater Tit, but are larger and better defined than on those of the Blue Tit. The nest is like those of the other two Tits, but is said to be often built in holes in banks, a position very seldom chosen by the other two.

30.—*Parus caudatus.* (Long-tailed Tit).

Eggs far smaller than those of any other of the Tit family; generally with a ring of very faint pink specks, round the larger end, but sometimes with only a few scattered over the egg and unspotted varieties are not of uncommon occurrence. The nest is undoubtedly the most beautiful British bird's nest. It is built of moss sprinkled with lichens and is perfectly domed, only a very small hole being left for the ingress and egress of the parent birds. It is generally built in thick quickset hedges or bushes.

31.—*Certhia familiaris.* (Creeper).

Egg always with a ring or circular blotch of darkish pink spots generally at the large end; occasionally varieties are found having the ring round the small end. The nest is roughly made of hay and leaves and is built in holes or clefts in trees.

32.—*Sitta europæa.* (Nuthatch).

The egg of this bird is larger than any other pink spotted one, being ¾ inch in length, otherwise it is exactly like the egg of the greater Tit. The nest, merely composed of dry leaves, is made in a hole in a tree, the orifice of which has been partially stopped up with clay by the parent birds, leaving only a small central hole just large enough for the passage of the bird.

33.—*Troglodytes vulgaris.* (Wren).

The spots on the eggs of this bird are fewer than on those of any of the Tit tribe; they are also scattered over the egg and not confined to the larger or smaller end. They are of a very pale pink. The nest is domed made of moss and lined with wool, hair, and feathers. It is built under the shelter of a bank or under the eaves of a thatched roof. A very favourite position is in the ivy climbing up a tree or building.

34.—*Hirundo rustica.* (Swallow).

The egg is the same size as that of the Nuthatch. It is nearly covered with *purple and pink* spots mixed. The nest is cup-shaped and made of mud lined with feathers. It is built in a great variety of places, in the shaft of a chimney, or on an old beam or rafter in a barn, but is never I believe found far from the dwellings of man.

*Spots, reddish brown.*

35.—*Accipiter nisus.* (Sparrow Hawk).

Eggs 1½ inches long. The ground colour is a very pale greyish white, with several large, well defined irregularly-shaped blotches of a rich red brown generally at the larger end; sometimes varieties are found having the blotches round the small end.

The nest, merely composed of sticks, is built in the fork of a tree, generally a fir. Sometimes the deserted nest of some other bird is appropriated.

36.—*Muscicapa grisecla.* (Spotted Flycatcher).

Eggs ¾ in. long, mottled and blotched with two shades of reddish brown, sometimes a few grey spots are intermingled. The nest is generally very slight and is built against a wall among the branches of a creeper. When, however, it is built on a ledge, as it often is, the nest is surrounded with quantities of loose moss.

37.—*Erythaca rubecula.* (Redbreast).

Eggs ¾ in. long, *thickly* mottled with fine specks of light orange brown, and rounder than those of the former species. The nest, of grass and horsehair, is made in some hole in a bank or wall, the space round the nest being filled up with oak leaves. Many anecdotes are told of robins building their

nest and rearing their young in the most extraordinary places. It is said that a pair of Robins once built their nest in a *human skull*.

*Spots, purplish brown, prolonged into streaks.*

The eggs of all the Bunting family may be distinguished by having dark rounded spots produced into long zigzag streaks.

38.—*Emberiza miliaria.* (Common Bunting).

Eggs a little under 1 inch in length. The white ground is nearly all clouded with pale grey blotches. On the grey blotches there are some rounded purplish brown blotches, ending in *short* streaks.

The nest is built in a hedge or bush not very high above the ground.

39.—*Emberiza citrinella.* (Yellow Hammer or Bunting).

Eggs not quite so large or so dark coloured as those of the last mentioned species. The streaks are exceedingly long, in many cases forming a complete network over the egg. The ground colour is also much lighter. The nest is either built on the ground in a tuft of grass, or only a few inches above it.

40.—*Emberiza schœniclus.* (Black-headed Bunting).

The eggs of this bird, both in ground colour and spots, are much darker than those of the other two Buntings. The ground colour is a brownish white, with dark brown spots and streaks chiefly at the larger end. The egg, again, is somewhat the smallest of the three.

The nest must be sought for in the water meadows among the reeds and low bushes which fringe the river's banks.

*Spotted or blotched with two shades of grey or brown.*

41.—*Caprimulgus Europæus.* (Goatsucker).

Eggs 1¼ in. long, thickly blotched and marbled with two shades of brownish grey, also generally with a few brown spots. The bird makes no nest but lays her eggs at the foot of a tree or shrub, on the bare earth, or at the most in a little hollow made for that purpose.

42.—*Curruca hortensis.* (Garden Warbler).

Eggs ¾ in. long, thickly marbled with grey clouds on which are greyish brown blotches, generally containing a small brown speck or line. The blotches sometimes have a slight greenish tint.

43.—*Curruca atricapilla.* (Blackcap)

The egg of this bird resembles that of *C. hortensis* in every respect except in having the grey clouds replaced by light brown ones. It can often scarcely be distinguished from that of the last species, but by its generally browner appearance.

44.—*Curruca sylviella*. (Lesser Whitethroat).

Eggs rather smaller than those of the last species, and generally with a ring of grey and brownish spots round the large end. Occasionally, however, these spots are equally dispersed over the egg and then it can only be distinguished from that of *S. hortensis* by its smaller size.

The nests of all these last three species are almost entirely alike, made of bents or dried grass and lined with horsehair.

45.—*Passer domesticus* (House Sparrow).

Eggs very variable indeed. The most general type is marked with clearly defined spots of a very dark grey, almost black. Occasionally, however, specimens are found thickly mottled with specks of light grey. The nest is always built in a hole, generally in a thatched roof, and composed of straw lined with almost any thing the bird can get hold of, bits of rag, sheep's wool, &c.

46.—*Cuculus canorus* (Cuckoo).

The eggs of this bird sometimes are exactly like some varieties of those of the House Sparrow; it is therefore never safe to name a cuckoo's egg unless you know for certain *from what nest it was taken*. Generally, however, the ground colour has a greenish tint, and among the smaller spots of dark grey a few purplish blotches can generally be seen. It is said that the bird has the power of varying the colour of its egg to suit that of the eggs with which it puts it, at any rate of putting its egg with those that resemble it most. This, however, needs confirmation. At any rate I think cuckoo's eggs are most generally found in the nest of the Meadow Pipit, whose eggs it most nearly resembles.

So nearly does the egg of the Cuckoo resemble those of the bird in whose nest it is placed, that frequently the only means of distinguishing it is by a peculiar *grain* on the shell, but which would require a practised ornithologist to detect. The only perfectly satisfactory method (according to Professor Newton) of finding out whether any particular egg is really that of the Cuckoo is by watching the nest till the eggs are hatched.

The most common nests to find it in, are those of the Meadow Pipit, Chaffinch, Robin, Hedge-sparrow, and Yellow-hammer.

47.—*Motacilla Yarrellii*. (Pied Wagtail.)

Eggs nearly covered with a profusion of *very small light grey* specks. The nest is built in a hole, in a great variety of places. I think its favourite situation is in a hole in one of the old pollards which fringe the bank of the river, but it is also commonly found in holes in old walls, out buildings, etc.

48.—*Alauda arvensis.* (Skylark).

Eggs very thickly speckled with *brownish* specks, sometimes of two shades. The nest is cup shaped, situated on the ground, but well concealed from observation by a tuft of grass.

*Ground colour, Blue or bluish green.*
*Spots, Purplish pink.*

49.—*Coccothraustes chloris.* (Greenfinch).

Eggs rather longer than those of the following species, and the ground colour generally rather more decidedly of a bluish green. The spots, with which it is rather sparingly scattered, are usually at the large end, and of two shades, pink and very deep purplish pink; there are generally, too, a few streaks. The nest is a very rough one outside, being composed of dry bents mixed and lined with a great quantity of sheep's-wool and horsehair.

50.—*Linota cannabina.* (Linnet).

The egg of this species resembles that of the former in every respect except in being a trifle smaller, in having the ground colour so pale as sometimes to be almost white, and in the spots being of a rather paler hue. The nest is much neater, and is lined with a great variety of materials, sometimes with the down from the willow catkins, mingled with a few horse hairs.

51.—*Carduelis elegans.* (Goldfinch).

Egg smaller than either of the preceding, with the ground colour of a more decided blue, and having a few purplish spots and streaks at the large end. The nest is one of the most highly finished of any of our English birds' nests, composed of moss intersprinkled with lichens and lined with *thistledown.*

52.—*Pyrrhula vulgaris.* (Bullfinch).

Eggs with a beautiful blue ground colour darker than the ground colour of any other finch's eggs, with a few very dark purplish spots at the larger end.

The nest is merely composed of thin roots and fibres, slightly hollowed out in the middle.

*Spots, Rust-red.*

53.—*Fringilla cœlebs.* (Chaffinch).

The spots on the eggs of this bird are very large and rounded, having the colour deepest in the centre of each spot and getting paler towards the edge, till it forms a kind of pale rust red cloud round the spot. The real ground colour, of a pale blue, is often nearly obscured by these pale red clouds. Occasionally unspotted blue varieties are found. The nest is composed of moss and lichens, lined with sheep's wool and horse-hair.

*Spots, Light brown.*

54.—*Saxicola rubetra.* (Whinchat).

Eggs with a quantity of very minute pale brown specks at the larger end often forming a zone, on a blue ground much darker than that of either of the other two *Saxicolæ.* The egg is beautifully glossy.

The nest is built on the ground in a tuft of heather or grass, generally with a *meuse* or track through the grass leading to it.

55.—*Saxicola rubicola.* (Stonechat).

Eggs similar to those of the former species, only having the specks *more numerous, larger,* and of a *darker tint,* on a light blue ground.

The nest is made on the ground in the centre of a furze bush, having an oblique passage leading down to it from the top of the bush. The sides of this passage are kept wonderfully neat by the parent birds, not a sprig being allowed to stick out of its proper place, but all being woven into one another so as to make the sides of the passage perfectly smooth.

56.—*Saxicola œnanthe.* (Wheatear).

Eggs very pale blue with a *very few* dark brown specks here and there over the egg. These specks are sometimes entirely wanting.

The nest, constructed of hay, wool, and horsehair, is placed in holes in old walls, and stone-heaps, but I think the most common locality is in deserted rabbit holes. These birds are tolerably plentiful in the Valley of Stones.

*Spots, Black.*

57.—*Turdus musicus.* (Song thrush).

Eggs 1¼ in. long with black spots or blotches on a beautiful blue ground. The nest is made of grass and moss and *lined with mud.*

58.—*Corvus monedula.* (Jackdaw).

Eggs 1¼ in. long, with black and greyish spots or blotches on a pale blue ground. Occasionally unspotted varieties are found.

The nest is situated in a hole in a great variety of places, such as church steeples, old barns, and often in the deserted nest of some other bird.

In Savernake forest nearly every hole in oak or beech tree large enough to admit the birds has, in the breeding season, its Jackdaw's nest, merely composed of horse-hair and perhaps a little straw.

*Spots or blotches, Brown.*

59.—*Corvus corone* (Carrion Crow).

Eggs 1½ in. long, nearly covered with brown blotches, on a pale blue ground; both blotches and ground, however, are darker than those of rooks' eggs. The nest is merely a large structure of sticks generally placed on a fork at the top of the highest trees.

60.—*Corvus frugilegus* (Rook).

The eggs of this species exactly resemble those of the last, except in being altogether of a lighter tint. The ground colour is of a rather more greenish hue. The nest differs from that of the crow in being rather smaller, and in being lined with materials rather finer than those of which the nest is mainly composed.

61.—*Pica caudata* (Magpie).

Eggs 1¼ in. long, very variable, some specimens nearly resembling those of the Rook or Crow. The most general type is that in which the egg is nearly covered with *well defined* brown *spots*. The nest, which is roughly domed and made of sticks and moss, is placed in a great variety of places, from the high tree top to a hedge; a nest has even been found in a gooseberry bush.

62.—*Garrulus glandarius* (Jay).

Eggs 1⅛ in. long. The ground colour of these eggs is almost obscured by the quantity of minute brown specks. Generally at the large end of the egg there are a few black lines.

The nest is composed of small sticks, and lined with roots, and is placed generally high up in some quickset bush or thorn tree.

63.—*Turdus Merula* (Blackbird).

Every one knows the eggs of this bird, with their irregular, reddish-brown spots on a pale blue ground. These are the earliest eggs in the spring; before the leaves have come on the hedges, the eggs may be found lying in the conspicuous hay nest.

The nest is like that of the thrush, strengthened by alternate layers of mud, but it is lined with hay, over the innermost mud coating. On this egg, like that of the Jay's, black streaks may be occasionally found at the larger end. It differs from the Jay's in having the spots much *fewer*, and more *irregularly shaped*, the ground colour, too, is rather darker.

*Ground colour brown.*

*Spots, a darker shade of ground colour.*

64.—*Falco tinnunculus* (Kestrel Hawk).

Eggs almost covered with blotches, and marblings of a rich reddish brown on a ground colour of a lighter shade.

The nest is merely a rough fabric of sticks, *sometimes* made by the parent birds, but generally the deserted nest of a crow or magpie.

65.—*Vanellus cristatus* (Lapwing, Peewit, or Plover).

Eggs 1⅛in. long, with large spots of *very dark* brown on a yellowish brown ground. The eggs of this bird, and indeed of all the Plover family, are very

pointed at the small end, which seems to be accounted for by two reasons; 1stly, because, as the eggs are disproportionately large compared with the size of the bird, the hen would not be able to cover them, unless they were packed together in the nest as closely as possible, which of course is effected by the eggs being arranged in the nest with all their points meeting in the centre. 2ndly, because, as some of the birds of this family lay their eggs on the bare ground, often near the edge of cliffs, the eggs might be blown over the cliffs if they were of the ordinary shape, but as it is, they only roll round in a circle. This may also be noticed in the eggs of the Guillemots, which are laid on narrow ledges of rocks overhanging the sea.

66.—*Crex pratensis* (Landrail).

Eggs 1¼in. long, with reddish brown spots *mixed with some light purple ones*, on a very light brown ground. The rough nest of hay, &c., is made on the ground in a tuft of long grass.

67.—*Gallinula chloropus* (Moorhen).

Eggs 1¾ in. long, with dull brown spots and blotches on a light brown ground. The rough and thin nest is made of dry water flags and is placed in a great variety of places by the river side.

68.—*Turdus viscivorus* (Missel Thrush).

Eggs 1⅛in. long, with reddish brown spots on a ligher ground, *sometimes with a faint bluish tinge.* This is one of our earliest spring bird's eggs. The large nest may be seen perched on the branch of a tree long before the leaves begin to appear, and so forming a very conspicuous object.

*Ground colour greenish grey.*
*Spots, a darker shade of same.*

69.—*Salicaria phragmitis* (Sedge Warbler).

Eggs ⅝in. long, of a very pale bownish green colour, almost covered with very small specks of a rather darker hue. The nest of dried bents, grass, &c., is placed in a low bush generally in water meadows.

70.—*Salicaria arundinacea* (Reed Warbler).

The eggs of this species differ from those of *S. phragmitis* in being of a lighter and more decided green, and in being mottled with darker *blotches* not *specks.*

The nest is built between 3 or 4 branches of the *withies* that grow so thickly in some water meadows, and is made of dried flags, and the flowering stalks of the reed. It is of great length, tapering to a point at the bottom; very frequently the birds have afterwards raised the walls of the nest, as they have built it too near the water's edge, and therefore when the river rises it would be covered and wetted through with the water.

71.—*Curruca cinerea* (White-throat).

Eggs very variable, but all have a decided green tinge. The most general colour is greenish with some *very dark* green blotches, on a brownish green ground. Sometimes specimens are found nearly covered with specks like the eggs of the Sedge Warbler.

The nest is very thin and fragile, so thin indeed that it can be seen through, and is composed of herbs lined with horse hair. The bird is very fond of building its nest in low bushes surrounded with nettles, hence it is sometimes called the " Nettle Creeper."

*Ground colour, Reddish brown.*

*Spots, a darker shade of same.*

72.—*Anthus arboreus* (Tree Pipit).

Eggs ¾in. long, exceedingly variable. Generally with roundish purple red spots on a light reddish brown ground. The egg can generally be distinguished by its reddish colour, and its rounded spots not unlike those on Chaffinch's eggs. They are laid in a mere cup-shaped grass nest, situated on the ground at the foot of a tree, or sheltered by a bunch of fern or long grass.

*Ground colour, dark grey. Spots, a darker shade of same.*

73.—*Anthus pratensis* (Meadow Pipit).

Eggs as variable as those of the Tree Pipit, and indeed only differing from them in being greyish instead of reddish, but even this distinction sometimes fails, as Meadow Pipit's eggs are sometimes met with of a decided reddish tinge. Generally, however, instead of rounded spots, they are thickly mottled with greyish, and occasionally reddish grey specks.

The nest is built on the ground, very often in an old cart rut or under a clod of earth.

*Ground colour, Pale yellowish brown.*

*Spots, a darker shade of same.*

74.—*Regulus cristatus* (Gold-crest).

The egg of this species is the smallest European bird's egg. It is almost covered with very fine yellowish specks on a slightly lighter ground. The nest is always suspended from the underside of a fir or yew branch, and is composed of moss lined with wool and feathers.

*Ground colour variable, orange or green.*

*Spots, a darker shade of ground colour in each case.*

75.—*Lanius collurio* (Red-backed Shrike or Butcher Bird).

There are two distinct varieties of the eggs of this bird, (1) with orange red spots on a lighter orange ground, (2) with greenish grey spots on a greyish ground. In both varieties, with a few exceptions, the spots form a ring round the larger end. Occasionally eggs are met with having a ring of orange and grey spots, *mixed*, on a grey ground. The nest is made of hay and is placed high up in thorny hedges.

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# FLORA

OF

# MARLBOROUGH,

BY

THE REV. T. A. PRESTON.

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Second Edition.—Part I.

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CHRISTMAS, 1870.

# FLORA OF MARLBOROUGH.

THE present edition of the Flora of Marlborough differs very materially from the former one, principally in giving short descriptions of the different species. In order to make these descriptions and tables as simple as possible, and also to prevent interfering with any published Floras of the British Isles, no notice has been taken of species which have not as yet been detected in the neighbourhood. In this way characters have been able to be taken which could not otherwise have been available. It is a question how far this system is advisable, and whether it will really benefit or retard the study of Botany. I am myself of opinion that the very best results may be anticipated, and the more the study of Botany, or of any other branch of natural science, is facilitated at the outset the more may we expect the science to be studied, and until a body of *facts* is secured, the real study of the science is very small indeed. I have not hesitated, therefore, to avail myself of Babington's Manual, (6th edition) Hooker's Student's Flora, Bentham's British Flora, and Syme's British Botany, selecting freely from each whatever suited my purpose. The tables and descriptions are therefore in one sense mere compilations, but I trust that something more may be observed. In selecting characters for the Tables, or even in the descriptions, I have endeavoured to take those which have been of more especial use to myself, when naming plants, and after drawing out a Table or description by the aid of specimens and from memory, I have then corrected and added from books. In some few instances (*e.g.*, the *Cruciferæ*) I have gone first to Bentham for hints for drawing out a Table, but as Babington's arrangement was followed, I had to make certain alterations, small indeed apparently, but nevertheless involving much time and trouble.

It is more than probable that errors have been made in some places, and improvements advisable in others, and I shall feel greatly obliged to any one who will point out either. Tables are easy enough to make up to a certain point, but all require to be very carefully applied and well used, ere they can be considered satisfactory. Numerous interruptions (often for days together) have, I am afraid, left their mark very strongly imprinted in parts,

but by bringing out the Flora in instalments, it will be more easily seen how the plan will be found to answer, and any improvements can be introduced in subsequent parts.

The arrangement of the species is that of Babington in the 6th edition of his "Manual." References are also made to Hooker's "Student's Flora," and Bentham's "Handbook of the British Flora." Ed. 1866.

The dates of flowering and localities have been drawn up from the six years' observations recorded in the Reports of the Natural History Society.

The country round Marlborough is divided into four districts, bounded by high roads.

I.—Between the Bath and Salisbury Roads.

II.—Between the Salisbury and Hungerford Roads.

III.—Between the Hungerford and New Swindon Roads.

IV.—Between the New Swindon and Bath Roads.

In the notices of first flowering "by" indicates that the specimen, when observed, had probably been out a day or two, but not longer.

Names of those whose Initials occur in the Flora.

| | |
|---|---|
| A.C.A. ... ... ... ... | A. C. Almack * |
| W.B. ... ... ... ... | Mr. W. Bartlett |
| E.R.B. ... ... ... ... | E. R. Berkeley * |
| A.B. ... ... ... ... | A. Bonney * |
| W.R.C. ... ... ... ... | W. R. Carles * |
| W.W.D. ... ... .. ... | W. W. Dayman * |
| G.W.D.L. ... ... ... ... | Rev. G. W. DeLisle |
| H.A.E. ... ... ... ... | H. A. Evans * |
| J.B.G. ... .. ... ... | J. B. Gilmore, Esq. |
| C.A.H. ... ... ... ... | C. A. Harrison * |
| J.E.H. ... ... ... ... | J. E. Hilliard * |
| A.C.H. ... ... ... ... | A. C. Hilton * |
| R.R.P.H. ... ... ... ... | R. R. P. Hilton * |
| F.E.H. ... ... ... ... | F. E. Hulme, Esq., F.L.S. |
| J.H.J. ... ... ... ... | J. H. Johnson * |
| P.T.M. ... ... ... ... | P. T. Macquoid * |
| W.M. ... ... ... ... | W. Mansell, Esq. |
| J.W.M. ... ... ... ... | Rev. J. W. Mills * |
| E.V.P. ... ... ... ... | E. V. Pigott * |
| J.P. ... ... ... ... | J. Pole * |
| J.J.P. ... ... ... ... | Rev. J. J. Pulleine * |
| T.F.R. ... ... ... ... | Rev. T. F. Ravenshaw |
| A.H.B.R. ... ... ... ... | A. H. B. Reynardson * |

| | |
|---|---|
| P.S.R. ... ... ... ... | P. S. Robinson * |
| G.F.R. ... ... ... ... | G. F. Ruck * |
| F.R.S. ... ... ... ... | F. R. Saunders * |
| C.A.S. ... ... ... ... | C. A. Sladen * |
| J.S. ... ... ... ... | Rev. J. Sowerby |
| F.S. ... ... ... ... | F. Storr, Esq. |
| F.E.T. ... ... ... ... | F. E. Thompson, Esq. |
| C.E.T. ... ... ... ... | Rev. C. E. Thorpe. |
| S.F.T. ... ... ... ... | S. F. Townsend * |
| E.F.imT. ... ... ... ... | E. F. im Thurn * |

* Old or Present Marlburians.

W. A. M. ... ... ... ... Wilts Archæological Magazine

## GLOSSARY.

Many more technical words than was originally intended have crept into the descriptions and tables. The following glossary, taken in a great measure from that in Professor Babington's Manual, will be found to contain almost, if not all, words not easily understood. Some alterations from the definitions in the Manual are made where it was deemed necessary from the very elementary character of the Flora. Notices of omissions or imperfect definitions will be thankfully received.

*achene*—when each seed is enclosed in a thin, hard, dry, tight-fitting covering, the seed and its covering is called an *achene*. The "seeds" of the strawberry are really achenes.

*adhering*—the uniting together of different parts, as a calyx to an ovary, or stamen to a petal (see *cohering*.)

*adpressed*—pressed close, as when hairs lie close to a stem; opposed to *spreading*.

*alternate*—placed successively on opposite sides of an axis, as leaves upon a twig: or opposite to the spaces between the parts of the next circle of organs in flowers, as stamens opposite the spaces between the petals: opposed to *opposite*.

*annual*—lasting only for one year: opposed to *perennial*.

*anther*—the expansion at the top of the stamen containing the pollen.

*apex*—the end furthest from the point of attachment.

*attenuated*—narrowed gradually.

*auricle*—a prolongation at the base of a leaf (see *stipule*).

*axil*—the upper angle formed by the union of a leaf with the stem.

*axillary*—placed in the axil.

*base*—the end at or nearest to the point of attachment.

*berry*—a pulpy fruit containing several seeds.

*bipinnate*—when the divisions of a pinnate leaf are themselves pinnate.

*blade*—the flat expanded portion of a leaf.

*bracts*—small leaves, generally different from the others, seated on the flower stalks (compare *stipules*).

*bristle*—a stiff hair.

*bulb*—a leaf-bud composed of fleshy scales.

*callous*—hard.

*calyx*—the outer circle of leaf-like organs forming the flower, usually green, called sepals.

*capsule*—a dry usually many-seeded seed-vessel.

*carpels*—the divisions of the ovary or capsule: the ovary is sometimes formed of one carpel or of several, which may be either united or separate.

*cleft*—deeply cut, but not to the midrib.

*cohering*—the attachment of similar parts to one another—as the petals, forming a tubular corolla (see *adhering*).

*contiguous*—touching or overlapping by their edges.

*cordate*—like the figure of the heart on cards.

*corolla*—the circle of leaves between the calyx and stamens, usually coloured, called petals.

*corymb*—an aggregation of flowers, where the branches and flower-stalks, although starting from different points, all attain the same level, the lower ones being much longer than the upper.

*cuticle*—the external skin.

*decumbent*—lying on the ground, but tending to rise at the end (see *procumbent*).

*definite*—any number under ten or twelve.

*denticulate*—with fine short triangular teeth.

*disk*—a fleshy space from which the stamens and pistils spring, or between them.

*evanescent*—soon falling off.

*filament*—the stalk of a stamen, supporting the anther: occasionally wanting.

*follicle*—an inflated carpel opening on the inner side only, where alone the seeds are placed. In some cases the carpels are united till the ovary is ripe when they separate (compare *pod*).

*free*—not united to one another.

*glabrous*—without hairs or other clothing.

*glands*—small wart-like secreting organs, usually raised above the surface on slender stalks; small cavities filled with oil imbedded in the substance of the petals or other parts of a plant.

*glandular*—having glands.

*glaucous*—green with a whitish-blue lustre.

*globular*—round like a globe.

*herbaceous*—the parts of a plant which are not woody; also organs, or parts of them, of a green colour.

*hispid*—covered with stiff hairs.

*hoary*—with greyish-white down.

*involucre*—a circle of bracts below a flower or aggregation of flowers.

*keel*—a prominent ridge.

*lanceolate*—at least 4 or 5 times as long as broad, broadest below the middle and tapering towards the summit.

*leaflets*—the subdivisions of a compound leaf, *i.e.*, of a leaf composed of parts which ultimately and naturally separate from one another.

*linear*—very long and narrow, with parallel sides until near the end.

*lyrate*—a pinnatifid leaf with the lobes successively and gradually enlarging from the stalk, and ending in one still larger lobe.

*membranous*—thin and flexible.

*node*—a point in a stem where one or more leaves are produced.

*nut*—the same as *achene*.

*oblong*—a figure rounded at each end, not broader at one end than at the other, and more than twice as long as broad.

*opposite leaves* are leaves springing from the same node on opposite sides of the stem: opposed to *alternate*.

*ovary*—the young seed-vessel.

*ovate*—egg-shaped: rather broader below the middle of its length. (Used of leaves.)

*ovoid*—egg-shaped with the broad end downwards. (Used of seed-vessels).

*pedicel*—the branch of a peduncle.

*peduncle*—flower-stalk.

*perennial*—living several years.

*persistent*—not soon falling off: opposed to *evanescent*.

*petals*—the divisions of the corolla.

*petiole*—the stalk of a leaf.

*pinnate*—when leaflets are arranged on opposite sides of a common stalk.

*pinnatifid*—deeply cut into segments nearly to the midrib.

*pistil*—the ovary, style, and stigma, taken together.

*pod*—an inflated carpel opening along 2 sides into 2 valves, with the seeds arranged along one side (see *follicle*).

*pollen*—minute grains, usually forming a yellow dust, inside the anther.

*procumbent*<br>*prostrate* } lying on the ground. (See *decumbent*).

*raceme*—when the flowers are borne, each on a separate stalk, attached to a single undivided main stalk.

*radical*—springing from just above the root.

*recurved*—bent moderately backwards.

*reflexed*—bent considerably backwards.

*regular*—when the parts of the flower, especially of the corolla, are equal and similar.

*rootstock*—a thick short underground stem.

*rosette*—a collection of leaves growing close together, like the petals of a double rose.

*runner*—a prostrate shoot rooting at its end.

*serrate*—toothed like a saw.

*sessile*—without a stalk.

*sepals*—the divisions of the calyx.

*spine*—a stiff, sharp, woody, persistent thorn.

*spreading*—standing out nearly at right angles to the stem.

*spurred*—furnished with a spur, or tubular extension of the lower part of a petal.

*stamens*—the circle or circles of organs between the corolla and ovary; each one usually composed of filament and anther.

*stellate*—radiating from a centre like a star.

*stigma*—the cellular part at the top of a carpel or style to which the pollen adheres.

*stipules*—leaf-like appendages at the base of the leaf-stalk (compare *bracts*).

*stole*—a lax trailing shoot from the top of the root, rooting at intervals.

*style*—the space between the ovary and stigma, frequently thread-like, but often wanting.

*tap root*—the main root which descends perpendicularly into the earth, emitting only very small fibrous branches.

*ternate*—growing in threes about the same point of a stem.

*toothed*—differs from *serrate* in having the sides of the teeth equal, and the tooth itself not pointing forwards.

*tuber*—a thickened underground fleshy part of the stem.

*tubercles*—little round knobs.

*turgid*—swollen.

*umbel*—when many stalked flowers spring from one point and reach about the same level.

*viscid*—sticky, clammy.

*whorled*—when several leaves, or other organs, proceed from the same node, arranged regularly round the stem.

# FLORA OF MARLBOROUGH.

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ALL flowering plants are divided into two *Classes*, Monocotyledons and Dicotyledons.

Dicotyledons have *two* seed-leaves (Cotyledons).
Leaves net-veined.
Stem, when perennial, with pith and bark.
Parts of the flower in multiples of 4 or 5.

Monocotyledons have *one* seed-leaf.
Leaves parallel-veined.
Stem without pith or bark.
Parts of the flower in multiples of 3.
Leaves not opposite or whorled.

Some of these characteristics are difficult to distinguish, in which case the others must be resorted to. It must be remembered, also, that the above characters, though *generally* applicable, are not *universally* so, and hence we must never rely upon *one* character alone. Where, however, an exception to any one of these occurs, it will be found that most, if not all, of the others will be applicable, and no real difficulty in determining to which class a plant belongs need be apprehended.

Dicotyledons are separated into 4 *Divisions*.

| | |
|---|---|
| Petals distinct. | |
| Stamens free from the calyx ..... | 1. Thalamifloræ. |
| Stamens attached to the calyx..... | 2. Calycifloræ. |
| Petals united ..... | 3. Corollifloræ. |
| Petals wanting ..... | 4. Incompletæ. |

## THALAMIFLORÆ.

So called because the stamens and other parts of the flower are attached separately to the *Thalamus* or expansion of the top of the flower stalk and are generally very easily recognised. Having observed whether the flower has distinct petals (*i.e.*, not united, as in Convolvulus), pull off one of the sepals, forcing it from the flower in the direction of the stalk. If any stamens become detached with the sepal, it will probably belong to No. 2, but if the sepal comes off alone it will belong to No. 1. Care must, however, be taken to examine a full-blown flower, as the parts of the flower, when just expanded, are very apt to adhere to one another, and in pulling off a sepal one or more stamens not unfrequently come off as well.

There are also some species belonging to this division, which really are petal-less and would therefore be classed with No. 4 if this character were alone considered. Such are *Clematis*, *Anemone*, *Thalictrum*, and *Caltha*, but which may be easily recognised by their numerous stamens.

*Scleranthus*, besides being petal-less, has also the stamens inserted on the calyx.

*Senebiera* and *Viola*, are *occasionally* petal-less; the latter, especially, produces petal-less flowers during the summer, which are the only ones that produce seed.

It will be necessary to observe also that *Fumaria* and *Polygala* have their petals partially coherent, and that in *Malva* the petals are decidedly coherent at the base.

Carpels one ... ... ... ... ... ... ... ... 2. Berberidaceæ.
Carpels many, separate ... ... ... ... ... 1. Ranunculaceæ.
Carpels more than one, united
  Stamens numerous
    Petals numerous ... ... ... ... ... 3. Nymphæaceæ.
    Petals irregular ... ... ... ... ... 7. Resedaceæ.
    Petals regular
      petals 4 ... ... ... ... ... ... 4. Papaveraceæ.
      petals 5
        Stamens free
          a low shrub ... ... 8. Cistaceæ.
          a tree ... ... ... ... 13. Tiliaceæ.
        Stamens in 1 set ... ... ... 12. Malvaceæ.
        Stamens in 3 sets ... ... 14. Hypericaceæ.
  Stamens definite
    Petals irregular
      Stamens 5, free ... ... ... ... 9. Violaceæ.

Stamens 6, in 2 sets ... ... ... 5. Fumariaceæ.
Stamens 8, in 2 sets ... ... ... 10. Polygalaceæ.
Petals regular
Stamens united
cells of ovary 1 seeded ... ... 16. Geraniaceæ.
cells of ovary many-seeded ... 18. Oxalidaceæ.
Stamens free
Stamens 6, 4 long and 2 short... 6. Cruciferæ.
Capsule 1 celled ... ... ... 11. Caryophyllaceæ.
Capsule many-celled ... ... 17. Linaceæ.
Two winged nuts ... ... ... 15. Aceraceæ.

## 1. RANUNCULACEÆ.

Stem woody, climbing ... ... ... ... ... ... 1. Clematis.
Stem herbaceous
Petals wanting
Fruit, achenes
Involucre of 3 leaves ... ... ... 3. Anemone.
No involucre ... ... ... ... ... 2. Thalictrum
Fruit, follicles ... ... ... ... ... ... 6. Caltha.
Petals small or imperfect
Fruit, achenes ... ... ... ... ... 4. Myosurus.
Fruit, follicles ... ... ... ... ... 7. Helleborus.
Petals conspicuous
Fruit, achenes ... ... ... ... ... 5. Ranunculus.
Fruit, follicles ... ... ... ... ... 8. Aquilegia.

## 1. Clematis Linn.

1. **C. Vitalba** Linn. *Traveller's Joy.* *Old Man's Beard.*
Bab. 3. Hook. 2. Benth. 2.
Hedges on a chalky soil. Sh. July to September.

Easily recognised by its trailing, woody stems. The plant supports itself by means of its leaf-stalks, which, below the leaflets, twine round adjacent bodies, and, when so used, remain after the fall of the leaves.

I.—Foot of Martinsell Hill, plentifully. Chisbury, *H.A.E.* Hedge at the side of the Bath Road, about half-a-mile beyond Manton, (probably planted) *J.W.M.*

II.—Crofton, *J.J.P.*

III.—Folly Farm; Mildenhall; Ramsbury. Axford, *W.R.C.* Row Down, *C.A.H.*

IV.—Hedge near the College Cricket Field (probably planted) *W.W.D.*

This year (1870) is the first time we have been enabled to get this plant in flower before leaving for the holidays; it was then only just in flower on July 16th.

## 2. Thalictrum Linn.

1. **T. flavum** Linn. *Meadow Rue.*

Bab. 4. Hook. 3. Benth. 4.

Wet places P. June.

Stem furrowed, from 2-4 feet high. Leaves bi-pinnate, each leaflet generally 3-lobed.

I.—Fyfield. Near the bottom of Granham Hill, *E. im T.* Clatford, *J.S.*

III.—Mildenhall, *F.R.S.* Poulton.

Very sparingly distributed: the localities at present known are situated along the Banks of the Kennet and Og. It has not been noticed at Bedwyn.

| | | | |
|---|---|---|---|
| 1865. | June 19. | 1868. | Bud June 2. |
| 1866. | ——— | 1869. | June 13. |
| 1867. | Bud June 21. | 1870. | June 10. |

Always over by the beginning of August.

## 3. Anemone Linn.

1. **A. nemorosa** Linn. *Wood Anemone.* *Wind Flower.*

Bab. 5. Hook. 3. Benth. 4.

Woods and thickets. P. March to May.

Has generally but one ternate leaf, similar to the Involucre and springing from a point of the root-stock near that from which the flower stalk proceeds. Flowers generally white, not unfrequently purple.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | April 6. | 1868. | March 2. |
| 1866. | March 18. | 1869. | Feb. 27. |
| 1867. | Feb. 20. | 1870. | March 20. |

Early specimens sometimes occur in February, but the general time of flowering is about the middle of March.

## 4. Myosurus Linn.

1. **M. minimus** Linn. *Mouse-tail.*

Bab. 5. Hook 4. Benth. 6.

Fields in a moist sandy or gravelly soil. A. May.

Leaves linear, rather fleshy. Flowers inconspicuous, very pale greenish yellow. The spike of achenes is very dense at first, but increases to 1-3 inches in length. The whole plant looks at first sight like a tuft of grass. This is one of the few species in this order with a definite number of stamens.

I.—Field on the top of Martinsell Hill, *J.J.P.* Brimslade; Huish. Pewsey, *J.H.J.* and *J.E.H.*

In the first locality mentioned, it cannot always be found—but in the Valley around Pewsey specimens may generally be found every year.

| | | | |
|---|---|---|---|
| 1865. | ——— | 1868. | Full fl. May 19. |
| 1866. | By May 5. | 1869. | May 1. |
| 1867. | ——— | 1870. | Quite over June 6. |

## 5. Ranunculus Linn.

The British species of this genus have either white or yellow flowers, forming two subdivisions, differing greatly in appearance and habit. Those with white flowers grow in water or in very damp muddy spots, (hence called *Batrachian* Ranunculi), and present several forms, variously united into species by different authors. In the table given below the species are those of Babington, as, whether considered true species or not, authors acknowledge as many forms, and for a Local Flora, *forms* are quite as important as *species*.

In the Batrachian Ranunculi there are two very distinct kinds of leaves, called respectively *floating* and *submersed*. The former generally (but not always) lie on the surface of the water, and consist of a flat expanded blade, of a rounded or oval form, and divided into about 5 lobes. The latter always grow under water, and are divided into numerous thread-like segments, which remain spread out when taken out of the water, or collapse into a shape like that of a camel-hair pencil, and thus supply two characters for determining the species. It must be remembered, however, that these submersed leaves soon get coated over with conferva and dirt, as well as become stiff when old, and thus lose their character: hence only those young leaves which are free from any coating are to be taken for observation. Sometimes the water in which the plants are growing dries up and they are left exposed on the mud. In this case the submersed leaves are replaced by others of which the

segments are shorter and thicker and covered with a cuticle, thus essentially differing from true submersed leaves, which wither very shortly after being taken out of the water.

Another character to be observed is the appearance of the flower. In some species the petals touch one another, and they are then said to be *contiguous*, in others the petals are quite separate, when they are said to be *star-like*.

The species hitherto observed about Marlborough may be thus tabulated.

*Submersed leaves none* ... ... ... ... ... ... 7. hederaceus.

*Floating leaves none or very rare*

Segments rigid, *lying in one plane* ... 6. circinatus.
Segments not collapsing... ... ... ... 1. trichophyllus.
Segments collapsing
Petals contiguous ... ... ... ... 4. pseudo-fluitans.
Petals star-like ... ... ... ... ... 2. Drouetii.

*Floating and submersed leaves present.*

Petals contiguous
Segments collapsing ... ... ... 4. pseudo-fluitans.
Segments not collapsing... ... ... 5. peltatus.
Petals star-like ... ... ... ... ... 3. heterophyllus.

Hooker unites nos. 1-6, and Syme nos. 1-5 into one species, called *aquatilis*.

The species with yellow flowers may be thus tabulated:

*Leaves undivided—glabrous*

Petals 5 ... ... ... ... ... ... ... ... 9. Flammula.
Petals 8 or more ... ... ... ... ... ... 10. Ficaria.

*Leaves divided or deeply cut*

Leaves glabrous
Petals small ... ... ... ... ... ... 8. sceleratus.
Petals conspicuous ... ... ... ... ... 11. auricomus.*

Leaves hairy
Carpels smooth
Calyx spreading
Stem erect, round, no runners 12. acris
Stem furrowed, with creeping runners... ... ... ... 13. repens.
Calyx reflexed ... ... ... ... ... 14. bulbosus.

Carpels covered with tubercles or prickles

leaves glabrous ... ... ... ... 16. arvensis.

leaves hairy ... ... .. ... 15. parviflorus.

* The first flowers of this species frequently have the petals wanting or imperfect.

1. R. trichophyllus Chaix. *Water Fennel.*

Bab 6. Hook 5. Benth. —

Ponds and ditches. P. May.

Submersed leaves blackish green. Floating leaves *very rare*. Stamens 8-15. Petals half as long again as the calyx, star-like, evanescent.

I. Pond between Pewsey and Devizes, F.S.

II. Bedwyn, J.S.

This species was not detected near Marlborough till 1869. It is considered to be a variety of *Pantothrix*, a sub-species of *aquatilis* by Hooker and others.

2. R. Drouetii F. Schultz.

Bab. 6. Hook. 5. Benth. —

Ponds and ditches P. April, May.

A much more delicate plant than *trichophyllus*. The floating leaves, (light green) when developed, soon decay. Stamens only from 5 to 10 in number. Petals not much longer than the calyx and star-like.

Has only been detected at Rockley by *E.R.B.*

1865. Full fl. May 25. 1866. Full fl. April 24.

It is considered a var. of *Pantothrix*, a sub-species of *aquatilis*, by Hooker and others.

3. R. heterophyllus Fries.

Bab. 6. Hook. 5. Benth. —

Ponds and streams. P. April to July

Segments of submersed leaves not collapsing. Floating leaves occasionally not developed—in which case it can be distinguished from *Drouetii* by its large petals and numerous stamens. The margins, next the stalk, of the floating leaves are nearly straight, the whole forming very nearly a complete circle. Stamens many ; petals large, star-like pesistent. Peduncles scarcely exceeding the leaves. The great difficulty is to distinguish this in all cases from *trichophyllus*.

I.—Clench Common; Cadley. Between Savernake and Grafton, *J.S.*

II.—Savernake Forest.

IV.—Avebury, *F.E.T.*

There is considerable difficulty about this species. At the time the "Flora of Marlborough" was published, *pseudo-fluitans* was not admitted as a species—and hence the localities for the two have been confused together. *Peltatus* seems also to be generally distributed and to be rather mixed up with *heterophyllus*.

| | |
|---|---|
| 1865. April 16. | 1868. April 14. |
| 1866. April 18. | 1869. April 13. |
| 1867. April 19. | 1870. April 17. |

### 4. R. pseudo-fluitans Newb.

Bab. 7. Hook. 5. Benth. —

In water, especially streams. P. April to July.

Segments of submersed leaves often 3-4 inches long, collapsing. Floating leaves not uncommon, long-stalked, divided into three lobes, (the division between the lobes extending halfway down), each having two or three rounded notches, and with the margins next the stalk rounded. Peduncles very long, exceeding the leaves; stamens many; petals large.

I. and III.—Generally distributed in the Kennet.

This seems to be the species commonly occurring in the Kennet, and I have therefore separated previous notices of *heterophyllus* found in the Kennet and transferred them to this species—but many more observations must be taken before any satisfactory conclusion can be arrived at. The dates of flowering mentioned under *heterophyllus* probably refer to this species. It comes into flower at Lockeridge some days earlier than at Marlborough, and very nearly about the same time every year.

### 5. R. peltatus Fries.

Bab. 8. Hook. 5. Benth. —

In water and wet places. P. April to July.

Segments of submersed leaves not collapsing (and thus distinguishing it from No. 4). Floating leaves long-stalked, the outer margins next the stalk rounded (and thus distinguishing it from No. 3). Peduncles tapering, rather larger than the leaves; stamens many; petals very large, sweet-scented.

1.—Cadley; top of Martinsell Hill; Clench Common; near Ivy's Farm. Huish, *J.S.* Pewsey, *J.S.*

I.—Savernake Forest.

| | |
|---|---|
| 1865. Full fl. May 13. | 1868. April 10. |
| 1866. Full fl. May 1. | 1869. Full fl. April 24. |
| 1867. Full fl. May 15. | 1870. April 25. |

### 6. R. circinatus Sibth.

Bab. 8. Hook. 5. Benth. 8.

Streams and ponds. P. May, June.

Segments of submersed leaves rigid, spreading in one plane. Petals large. Easily recognised by the submersed leaves.

I.—Canal near New Mill, Savernake, and Wilcot.

II.—Canal near Bedwyn.

1869. By May 27. 1870. Full fl. May 28.

### 7. R. hederaceus Linn. *Ivy-leaved Ranunculus.*

Bab. 9. Hook. 6. Benth. 8.

Shallow ponds or mud. P. May, June.

Leaves generally opposite and with a dark spot, the lobes being broadest at their base. Stamens 6-8. Petals small, very slightly exceeding the calyx.

I.—Huish, near Draycott Farm, *J.S.*

II.—Bedwyn, *J.S.*

1868. Full fl. May 19. 1870. Full fl. May 28.

1869. Full fl. May 1.

A very well-marked species. The two localities mentioned above were not found for many years. It is a decidedly scarce plant near Marlborough.

### 8. R. sceleratus Linn. *Celery-leaved Crowfoot.*

Bab. 9. Hook. 7. Benth. 9.

By and in ditches and ponds. A. April to June.

Stem sometimes 2 feet high, and from 1 to 2 inches in diameter at the base, very succulent. Calyx reflexed; head of fruit oblong; flowers small, pale yellow. Often grows in water, and before the flowering stem is produced the leaves lie on the surface of the water like one of the Batrachian *Ranunculi*. In fact it forms a connecting link between the two divisions.

I.—Near Devizes, *J.S.* and *F.E.T.*

II.—Great Bedwyn, *W.B.* This locality has not yet been confirmed.

IV.—Bicknoll, *J.S.* and *F.E.T.*

1869. By April 29. 1870. By May 24.

9. R. Flammula Linn. *Lesser Spearwort.*

Bab. 10. Hook. 6. Benth. 9.

Wet places. P. May to October.

Stem from 6 to 18 inches high, generally slender and rooting at the base. Leaves very variable in shape, varying from ovate to narrow-lanceolate, but never divided. Petals pale yellow.

I.—Top of Martinsell Hill, *J.J.P.* Pond near Ivy's Farm, *J.W.M.* Manningford Bruce, *T.F.R.* Huish, *J.S.* Brimslade. Fox Wood.

II.—Great Bedwyn, *J.J.P.* Chisbury, *J.S.*

III.—Axford, *E. im T.*

By no means a common species, occurring in small quantities more especially in the neighbourhood of the Canal.

1865. June 12. 1868. May 19, at Reading.
1866. May 9. 1869. June 10.
1867. ——— 1870. May 30.

Seldom out in flower till June. The specimen recorded in 1866 was a remarkably early one.

10. R. Ficaria Linn. *Pilewort. Lesser Celandine.*

Bab. 11. Hook. 9. Benth. 9.

Damp places. P. Feb. to April or May.

Root producing thick club-shaped tubers. Stem decumbent at the base. Leaves broadly heart-shaped, the lower ones having the lobes at the base over-lapping, or not over-lapping, forming two varieties. Sepals 3; Petals 8-12.

A very troublesome weed, as the tubers break off very easily, each one giving rise to a fresh plant. If the plant is dug into the ground, it works its way up to the top of the soil, branching out as it proceeds, and at each node producing fresh tubers, and thus increasing the number of plants amazingly. Towards the end of the season fresh tubers are produced at the nodes, even when above ground.

Very abundant.

1865. March 6, not fully out till April. 1868. Feb. 15.
1866. Feb. 10. 1869. Jan. 30.
1867. Feb. 9. 1870. March 1.

11. R. auricomus Linn. *Goldilocks.*

Bab. 11. Hook. 7. Benth. 10.

Woods and thickets. P. April, May.

Root-leaves very variable, entire or more or less cut: stem leaves only at the points where branches are given off. Flowers smaller than those of the buttercup. The petals (especially when the plant first comes into flower) often imperfect or wanting, and constituting the variety *depauperatus.*

Not unfrequent in the copses and hedges, but much more common in some years than in others.

| | | | |
|---|---|---|---|
| 1865. | fl. and seed Ap. 20. | 1868. | March 29. |
| 1866. | April 16. | 1869. | March 8. |
| 1867. | April 19. | 1870. | April 10. |

12. **R. acris** Linn. *Upright Crowfoot.*

Bab. 11. Hook. 7. Benth. 10.

Meadows and pastures. P. April to December.

Easily recognized by its upright stems, spreading sepals and round peduncles. The root of this species is very variable; sometimes the root-stock descends straight into the ground, at others it creeps along the surface, branching out more or less, and 4 or 5 inches long.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | May 8. | 1868. | April 5. |
| 1866. | May 9th at Bedwyn, later at M. | 1869. | April 18. |
| 1867. | April 28. | 1870 | April 14. |

13. **R. repens** Linn. *Creeping Crowfoot.*

Bab. 11. Hook. 7. Benth. 10.

Damp places. P. April to December.

Stem producing creeping runners. Peduncles furrowed. Flowers larger than those of the buttercup and of a deeper yellow.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | May 8. | 1868. | April 23. |
| 1866. | March 17, May 3. | 1869. | Feb. 27 (hybernated.) |
| 1867. | April 29. | 1870. | April 20. |

14. **R. bulbosus** Linn. *Bulbous Crowfoot. Buttercups.*

Bab. 11. Hook. 8. Benth. 11.

Meadows and pastures. P. April, May.

The two previous species are often mistaken for this, which is at once known by the sepals being bent back so as to lie along the furrowed (not round) peduncle. The stem also is expanded at the base like a *bulb*, though not a true one.

Very common.

| | | | |
|---|---|---|---|
| 1865. | April 24. | 1868. | April 9. |
| 1866. | April 17. | 1869. | March 30. |
| 1867. | April 17. | 1870. | April 7. |

15. **R. parviflorus** Linn. *Small-flowered Crowfoot.*

Bab. 12. Hook. 8. Benth. 11.

Cornfields and dry banks. A. April, May.

Stem procumbent, sepals reflexed as in *R. bulbosus*. Petals small, hardly longer than the sepals, pale yellow. Whole plant hairy.

I.—Top of Martinsell Hill.

II.—Great Bedwyn, *W.B.* (locality not confirmed).

IV.—Devizes *J.S.* and *F.E.T.*

1865. by May 25. 1869. April 27.

16. **R. arvensis** Linn. *Corn Crowfoot.*

Bab. 12. Hook. 8. Benth. 11.

Corn-fields. A. May, June.

Known at once by its prickly carpels. Stem solitary, glabrous, flowers rather small, pale yellow.

Generally distributed, but only in cereal crops. Probably not a true native, but a weed of cultivation.

1865. May 17. 1868. May 15.

1866. May 23. 1869. May 1.

1867. by June 10. 1870 May 20.

Has been found in flower in November and December.

R. **hirsutus** Curt. has been reported by Mr. Bartlett as having been found at Bedwyn, but the locality has not been confirmed.

It is not very unlike a Buttercup, but with pale yellow flowers and without a bulb-like expansion at the base of the stem.

## 6. Caltha Linn.

1. C. **palustris** Linn. *Marsh Marigold.*

Bab. 12. Hook. 9. Benth. 12.

Marshy places. P. March to June.

A coarse dark green glabrous plant, with large golden-yellow flowers. The stems about a foot, but sometimes as much as three feet, in height, often decumbent at the base and rooting at the nodes. Known at once by its having no petals (the coloured leaves being sepals) and its fruit consisting of from 5 to 10 follicles.

Abundant.

1865. April 13. 1868. March 23.

1866. March 21. 1869. March 5.

1867. Feb. 27. 1870. March 20.

Not unfrequently a few plants flower again in September and October.

## 7. Helleborus Linn.

1. **H. viridis** Linn. *Green Hellebore.* *Bear's Foot.*

Bab. 13. Hook. 10. Benth. 1.

Thickets. P. March, April.

About a foot high. Radical leaves not fully developed till after flowering. Sepals green, persistent. Petals small, tubular. The plant has only about three or four large, drooping, greenish-yellow flowers.

I.—Preshute water meadows, *A.B.*, (a single plant, not observed of late years).

II.—Great Bedwyn, *W.B.*

III.—Near Elcott Mill, *J.W.M.*

IV.—Ogbourn, *A.H.B.R.*

A scarce plant, only in any quantity at Ogbourn.

| | | | |
|---|---|---|---|
| 1865. | ——— | 1868. | March 4. |
| 1866. | Full fl. April 18. | 1869. | Feb. 24. |
| 1867. | By April 8. | 1870. | March 12. |

## 8. Aquilegia Linn.

1. **A. vulgaris** Linn. *Columbine.*

Bab. 13. Hook. 11. Benth. 14.

Woods and thickets. P. May, June.

Stem about two feet high. Radical leaves twice or thrice ternate, on long stalks. Petals tubular, spurred, like a cornucopia, dull purple.

I.—Wan's Dyke near Clatford, *P.T.M.*

II.—Great Bedwyn, *W.B.* Marlborough Forest, *W.A.M.*

The localities in II have not been verified.—The first is the only place as yet known to us, where it is probably wild, but there is very little of it there.

| | | | |
|---|---|---|---|
| 1865. | By June 11. | 1868. | May 4. |
| 1866. | (Cult.) about May 12. | 1869. | May 12. |
| 1867. | (Cult.) May 7. | 1870. | May 15. |

## 2. BERBERIDACEÆ.

### 1. Berberis Linn.

1. **B. vulgaris** Linn. *Barberry.*

Bab. 14. Hook. 12.. Benth. 16.

Hedges. Sh. May, June.

A shrub with a 3-parted spine at the base of each taft of leaves. Flowers in racemes, stamens 6, curiously elastic, springing forwards when touched on the inner side of their base. Fruit, a red oblong berry, with from 1-3 seeds.

Occurs in hedges, but very rarely.

I.—Clatford, *G.F.R.* Granham Farm.

| | | | |
|---|---|---|---|
| 1865. | ——— | 1868. | By May 5. |
| 1866. | Bud May 13. | 1869. | May 9. |
| 1867. | May 13. | 1870. | By May 22. |

## 3. NYMPHÆACEÆ.

### 1. Nuphar Smith.

1. **N. lutea** Linn. *Yellow Water-Lily. Brandy-bottle.*

Bab. 15. Hook. 13. Benth. 18.

Still waters. P. June, July.

Sepals 5 or 6, much larger than the numerous petals. Carpels united, forming a many-celled ovary. Floating leaves cordate, thick and leathery. Submersed leaves thin and transparent.

II.—Canal near Great Bedwyn, *J.S.*

1870. June 17.

Has possibly been introduced recently, as no records of its existence in the neighbourhood occurs, not even in Mr. Bartlett's list. It also occurs near Upavon.

The White Water-lily does not occur near Marlborough.

## 4. PAPAVERACEÆ.

This order is represented by two genera, one of them (*Chelidonium*) embracing only one species, whilst the other (*Papaver*) has five. The two genera are very distinct. Both have 2 sepals, 4 petals, and numerous stamens, —but in

*Papaver*, the flowers are red or purple, stigmas numerous and plant covered with stiff bristles (except *P. somniferum*).

in *Chelidonium* the flowers are yellow, stigmas two, and plant very sparingly hairy.

## 1. Papaver Linn.

The five species found about Marlborough may be thus distinguished—

Plant glabrous ... ... ... ... ... ... ... ... 5. somniferum.
Plant hairy
  Capsule glabrous
    Capsule globular ... ... ... ... ... 2. Rhœas.
    Capsule oblong
      Juice white ... ... ... ... ... 3. dubium.
      Juice yellow ... ... ... ... ... 4. Lecoqii.
  Capsule bristly ... ... ... ... ... ... ... 1. Argemone.

### 1. P. Argemone Linn. *Long Prickly-headed Poppy.*

Bab. 16. Hook. 15. Benth. 20.
Corn-fields. A. May, June.

Easily recognised by its prickly capsules.

Near Ivy's Farm, *P.S.R.* Martinsell, *J.S.* Pewsey, *J.S.* Huish.

Occurs only in the green-sand district, but not uncommonly there.

| | | | |
|---|---|---|---|
| 1865. | May 23. | 1868. | ——— |
| 1866. | By June 13. | 1869. | May 15. |
| 1867. | ——— | 1870. | May 20. |

### 2. P. Rhœas Linn. *Common Red Poppy. Corn Rose.*

Bab. 17. Hook. 15. Benth. 20.
Arable fields. A. May or June, to October.

Known at once by its globular capsules, and the peduncles covered with spreading hairs. The var. *strigosum*, which has been found at Poulton by *F.E.T.*, has the hairs of the peduncles *adpressed*, in which case it can be recognised from No. 3. (*P. dubium*) by its globular capsules.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | Nearly out May 25. | 1868. | May 19. |
| 1866. | May 30. | 1869. | May 12. |
| 1867. | June 16. | 1870. | June 5. |

### 3. P. dubium. Linn. *Long-headed Poppy.*

Bab. 17. Hook. 15. Benth. 20.
Arable fields. A. May to October.

This and the next are generally united into one species, in which case this is considered as the var. *Lamottei* of Boreau.

Occurs principally in I. But it is by no means common.

| | | | |
|---|---|---|---|
| 1865. | By May 25. | 1868. | May 26. |
| 1866. | May 27. | 1869. | May 25. |
| 1867. | ——— | 1870. | May 30. |

### 4. P. Lecoqii Lamot ?

Bab. 17. Hook. 15. Benth. —
Arable fields. A. May to September.

Its principal peculiarity is the *yellow* juice, by which it may at once be known. There are differences in the capsule between this and *P. dubium*, but not very easily seen.

Apparently nearly as common as the last, but I cannot make out whether it affects particular soils or not.

I.—Waste ground near the Railway Station, Marlborough, *G.F.R.* and near the College, *R.R P.H.* Huish *J.S.*

II.—Great Bedwyn.

III.—Mildenhall. *F.E.T.*

IV.—Yatesbury, (plentiful).

| | | | |
|---|---|---|---|
| 1865. | May 25. | 1868. | ——— |
| 1866. | June 14. | 1869. | May 27. |
| 1867. | ——— | 1870. | June 21. |

[5. P. somniferum. Linn.

Bab. 17. Hook. 15. Benth 19.
An escape from gardens. A. June.

Found occasionally on the Railway banks, and waste ground.]

## 2. Chelidonium. Linn.

1. C. majus. Linn. *Greater Celandine.*

Bab. 18. Hook. 16. Benth. 21.
Hedge-Banks near houses. P. May to September.

The flower bears a slight resemblance to a Crucifer, but its numerous stamens and yellow juice, besides other more important though less obvious distinctions, will at once prevent the mistake.

Generally distributed.

| | |
|---|---|
| 1865. April 26. | 1868. April 2. |
| 1866. May 1. | 1869. April 27. |
| 1867. May 7. | 1870. April 25. |

## 5. FUMARIACEÆ.

## Fumaria. Linn.

1. F. officinalis. Linn. *Fumitory.*

Bab. 19. Hook. 18. Benth. 23.
Cultivated ground. A. April to Nov. or Dec.

Sepals 2, pale pink, like 2 scales, one on each side, broader than the pedicel and one-third the length of the corolla, soon falling. Petals 4, the two outer dissimilar, one being spurred at the base, the other very narrow and expanded at the tip so as to be ladle-shaped. The two inner smaller and coherent at the tips. All four pale pink with much darker tips. Fruit a one-seeded nut, rather broader than long.

Commonly distributed.

| | |
|---|---|
| 1865. April 20. | 1868. May 11 |
| 1866. April 26. | 1869. Feb. 16. (hybernated.) |
| 1867 May 26. | 1870. April 16. |

## 6. CRUCIFERÆ.

A very well-marked Order, the genera of which are difficult to discriminate. All the species belonging to this Order have 4 sepals, and 4 petals, arranged in the form of a cross (whence the name *Cruciferæ*) and all but one have six stamens, 4 long and 2 short. The single exception (*Cardamine hirsuta*) has only 4 stamens.

The fruit is a pod, composed of two valves (carpels), with a membranous partition between them. These pods may be classed under two divisions, (i) those whose length is at least 3 or 4 times as long as the breadth, and (ii) those whose length is not much longer than the breadth. One genus (*Raphanus*) has the pod jointed. In some species the pod is lengthened out more or less at the extremity and is then said to be *beaked*.

The structure of the seed is very important; but as the seed is generally very small, it is unadvisable to make use of it in an elementary "Flora." The subjoined table will probably be sufficient for all our Marlborough genera.

*Pods long.*

Flowers white or purple

Leaves all undivided

Leaves all stalked ... ... ... ... ... 7. Alliaria.

Upper leaves clasping the stem ... ... 4. Arabis.

Upper leaves not clasping the stem ... 6. Sisymbrium.

Leaves pinnate

Seeds in two distinct rows ... ... 2. Nasturtium.

Seeds in one row ... ... ... ... ... 5. Cardamine.

Flowers yellow

Leaves all entire

Pod flattened ... ... ... ... ... 1. Cheiranthus.

Pod quadrangular ... ... ... ... 8. Erysimum.

Leaves (at least the lower ones) pinnatifid or pinnate

Pods adpressed

All the leaves pinnatifid ... ... 6. Sisymbrium.

Upper leaves entire ... ... 10. Sinapis.

Pods spreading

Plant entirely glabrous

All the leaves pinnatifid ... 2. Nasturtium.

Upper leaves entire ... ... 3. Barbarea.

Lower leaves, at least, hispid

Sepals erect ... ... ... ... 9. Brassica

Sepals spreading ... ... ... 10. Sinapis.

*Pods short.*

Partition broad

Flowers white ... ... ... ... 12. Draba.

Flowers yellow ... ... ... ... ... 11. Alyssum.

Partition narrow

Pods very flat and broad (½-⅔ inch) 14. Thlaspi.

Pods flat ¼ inch long ... ... ... 15. Lepidium.

Pods wrinkled ... ... ... ... ... 17. Senebiera.

Pods triangular ... ... ... ... 16. Capsella.

*Pods jointed* ... ... ... ... ... ... ... ... ... ... 18. Raphanus.

*Pods never ripening* ... ... ... ... ... .. ... ... 13. Armoracia.

## 1. Cheiranthus Linn.

1. C. Cheiri Linn. *Gilliflower. Wallflower.*

Bab. 24. Hook. 22. Benth. 28.

Old walls. P. April, May.

In the Wilts Flora, "Marlborough" is put down as a station for this plant. A straggler has been found on the Railway Bank, some distance from any garden, and for this reason it is added here—but it certainly cannot be considered an indigenous Marlborough plant.

The dates of flowering of cultivated specimens are

1865. —— 1868. April 1.

1866. Feb. 10. April 10. 1869. ——

1867. April 7. 1870. Full fl. May 18.

## 2. Nasturtium R. Br.

The two species at present detected near here are easily distinguished by the colour of their flowers, *N. officinale* has white flowers, with the petals twice as long as the calyx, *N. palustre* yellow ones with the petals scarcely exceeding it.

1. N. officinale R. Br. *Water-Cress.*

Bab. 24. Hook. 22. Benth. 29.

Running water. P. May to November.

Leaves very variable:—the plant can, however, be "confounded with none of the British Cruciferæ, except those of the genus *Cardamine*, from which its short turgid pods, with the seeds in two rows, form a sure method of distinguishing it."—*Dr. Syme.*

Common in the Kennet and Og.

| | | | |
|---|---|---|---|
| 1865. | By June 8. | 1868. | May 27. |
| 1866. | June 6. | 1869. | May 21. |
| 1867. | June 5. | 1870. | May 28. |

2. **N. palustre** D.C. *Marsh Yellow-Cress.*
**N. terrestre** Sm.

Bab. 25. Hook. 22. Benth. 30.
Wet places. P. May to July.

Petals scarcely larger than the calyx. Pods short and thick—almost short enough to cause this species to be ranked among the short-podded ones.

I.—Lockeridge. Pond on the south of Martinsell, *J.S.*; Bedwyn, *G.W.D.L.*
III.—Avebury, *F.E.T.*

| | | | |
|---|---|---|---|
| 1865. | ——— | 1868. | Full fl., May 19. |
| 1866. | ——— | 1869. | May 7. |
| 1867. | ——— | 1870. | May 18. |

## 3. Barbarea. R. Br.

1. **B. vulgaris** R. Br. *Winter-Cress. Yellow Rocket.*

Bab. 25. Hook. 23. Benth 29.
Hedgebanks and damp places. B. and P. May to July.

Stem angular, from 1 to 3 feet high. Radical leaves in a rosette, (usually decaying by the time the flowers expand,) pinnate with the terminal leaflet much larger than the others. Intermediate leaves pinnatifid with a large toothed terminal lobe, uppermost leaves with a few irregular teeth, all sessile and embracing the stem.

Generally distributed, though not very common.

| | | | |
|---|---|---|---|
| 1865. | April 30. | 1868. | May 1. |
| 1866. | May 16. | 1869. | April 20. |
| 1867. | May 10. | 1870. | May 12. |

## 4. Arabis Linn.

1. A. hirsuta. R. Br. *Hairy Rock-Cress.*

Bab. 26. Hook. 24. Benth. 32.

Walls and banks. B. April, May.

Stem simple, very rarely branched. Lowermost leaves attenuated into a short foot-stalk, toothed or entire. Petals about three times as long as the sepals, white. Pods from four to nine times as long as their pedicels.

I.—Clatford. Overton, *J.S.*

III.—Mildenhall.

IV.—Silbury Hill, *Mr. Coward, in W.A.M.* Row Down *E.V.P.*

| | | | |
|---|---|---|---|
| 1865. | Fl. and seed June 7. | 1868. | March 14. |
| 1866. | April 12. | 1869. | May 5. |
| 1867. | April 25. | 1870. | May 12. |

## 5. Cardamine Linn.

1. C. sylvatica Link.

Bab. 27. Hook. 25. Benth. 34.

Shaded places. A. April, May.

B or P. according to Dr. Syme.

This and the next are generally united into one, and are occasionally rather difficult to discriminate. Stem wavy (more leafy than in *C. hirsuta*). Rootstock short with a few fibres, but no tap root. Stamens 6; style long; fruit-stalks spreading. "Sometimes it flowers the first year, and then the tap root remains, as in *C. hirsuta.*—*Dr. Syme.*

It is stated to be "not uncommon" in Wiltshire generally, but it is certainly far from common near Marlborough, all localities at present known being in I.

Bedwyn, *J.J.P.* Brimslade. Clatford.

Only one date of flowering has been recorded viz. 1866. fl. and seed May 5.

2. C. hirsuta Linn. *Hairy Bitter-Cress.*

Bab. 27. Hook. 25. Benth. 34.

Damp places. A. Feb. to May.

Stem nearly straight, with a distinct tap root. Stamens 4; style short; fruit-stalks erect.

Tolerably common.

I.—Marlborough, Clatford, West Woods. Pewsey, *T.F.R.*

II.—Waste ground near Savernake, *J.J.P.*

III.—Mildenhall.

| | | | |
|---|---|---|---|
| 1865. | April 8. | 1868. | Feb. 13. |
| 1866. | By Feb. 10. | 1869. | Full fl. Feb. 13. |
| 1867. | By Feb. 19. | 1870. | By March 17. |

3. C. **pratensis** Linn. *Cuckoo-flower. Lady's Smock.*

Bab. 27. Hook. 25. Benth. 34.

Moist meadows. P. April to June.

Leaflets of the lower leaves roundish and angulated, of the upper leaves long and narrow. Petals large, lilac or white. Anthers yellow.

Abundant. Double varieties occur at Clench, *J.J.P.* and *J.W.M.* Foot of Martinsell Hill, Pewsey side, *T.F.R.* Cadley, *J.J.P.*

| | | | |
|---|---|---|---|
| 1865. | April 20. | 1868. | March 31. |
| 1866. | April 22. | 1869. | March 25. |
| 1867. | April 18. | 1870. | April 14. |

## 6. Sisymbrium Linn.

1. S. **officinale** Scop. *Hedge Mustard.*

Bab. 28. Hook. 27. Benth. 36.

Hedgebanks and waste places. A. May to October.

Easily recognized by its very small yellow flowers and its long wiry stems. The pods are pressed close to the stem (upon which they are almost sessile), and are arranged in racemes of which the terminal one is longest, the side ones spreading out horizontally.

Commonly distributed but far from abundant.

| | | | |
|---|---|---|---|
| 1865. | May 4. | 1868. | May 15. |
| 1866. | June 10. | 1869. | April 13. |
| 1867. | June 18. | 1870. | May 12. |

A very uncertain plant as regards its time of flowering.

2. S. **thalianum** Gaud. *Thale-cress. Wall-cress.*

Bab. 29. Hook. 27. Benth. 32.

Walls and banks. A. April, May, and again in the autumn.

A very different plant from the preceding, and agreeing more in habit with *Arabis hirsuta*. It is placed here from the structure of its seed. Radical leaves forming a rosette, attentuate at the base and stalked : stem-leaves few, narrower than the radical leaves and sessile: all undivided and toothed on the edge. Flowers small, white, on slender stalks. Pods spreading, angular on the back, not twice as long as their pedicels.

Not common.

I.—Clatford. Foot of Martinsell Hill; Wootton Rivers, *J.J.P.*

| | | | |
|---|---|---|---|
| 1865. | fl. and seed May 2. | 1868. | June 3. |
| 1866. | April. 12. | 1869. | Feb. 26. |
| 1867. | ——— | 1870. | seed May 22. |

## 7. Alliaria Adans.

1. **A. officinalis** Andrzj. *Jack-by-the-Hedge. Sauce-Alone. Garlic Hedge-Mustard.*

Bab. 29. Hook 27. (Sisymbrium Alliaria) Benth. 37.

Hedge-banks. B. April to June.

Easily recognized by its large, thin, undivided leaves (which are all stalked and smell like Garlic when bruised) and its white flowers.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | nearly open April 25. | 1868. | April 14. |
| 1866. | April 23. | 1869. | April 12. |
| 1867. | April 23. | 1870. | April 20. |

## 8. Erysimum Linn.

1. **E. cheiranthoides** Linn. *Worm-seed.*

Bab. 29. Hook. 28. Benth. 37.

Cultivated ground. B. June to August.

Leaves lanceolate with tripartite hairs, narrowed into a short footstalk. Pods quadrangular, twice as long as their pedicels.

The specimens found by *F.E.T.* at Avebury (the only locality at present known) were very small and weak, and though apparently wild, may not be really so. It is stated by Babington to be "Wild in the Fens." Syme says "not uncommon in the South of England, particularly in the neighbourhood of London."

1870. June 21.

## 9. Brassica Linn.

1. **B. campestris** Linn. *Swede.*

Bab. 30. Hook. 29. Benth. 40.

Borders of fields. A. or B. April to July.

Leaves all glaucous, the radical ones hispid, the rest glabrous. "Flowers a sort of orange-buff," (H. C. Watson, Esq.)

var. *b.* **B. Rapa** Linn. *Turnip.*

Radical leaves green, not glaucous, hispid. Stem leaves glaucous and glabrous. "Flowers bright buttercup-yellow" (H. C. Watson, Esq.)

Both of these varieties are casual relicts of sown crops. There is a third form of this species (?) viz. **B. Napus** *Linn*, the *Rape* or *Coleseed*, which is also very difficult to discriminate, the readiest character being "Flowers remaining till the corymb expands into a raceme," or, in the words of Babington, "Raceme elongated at the time when the flowers expand." In *campestris*, on the other hand, the flowers "fall off before the corymb lengthens into a raceme," or in other words "raceme close, the open flowers rising above the buds. There is still much confusion about this species, and I have therefore confined myself to *B. campestris*.

| | |
|---|---|
| 1865. April 20. | 1868. April 4. |
| 1866. Feb. 17. | 1869. April 18. |
| 1867. April 19. | 1870. April 19. |

## 10. Sinapis Linn.

This genus is now generally united with Brassica, as the specific characters of the two genera differ very slightly.

1. **S. nigra** Linn. *Black Mustard.*

Bab. 30. Hook 30. (Brassica). Benth. 41.

River Banks. A. April to September.

Stem from 1 to 4 feet high with numerous spreading branches in the upper part. Less hairy than the other two species of the genus, sometimes quite glabrous especially in its upper part. Lower leaves lyrate with a large terminal lobe, upper leaves lanceolate, entire. Pods adpressed.

Pewsey, *T.F.R.* Devizes, *J.S.* and *F.E.T.*

In the Wilts Archæological Magazine, it is said to occur at Marlborough, but we have only detected it at Devizes, and have not been able to confirm the Pewsey Station.

2. **S. arvensis** Linn. *Charlock.*

Bab. 30. Hook. 30 (Brassica Sinapistrum.) Benth. 40.
Cultivated fields. A. April to December.

Stem from 1 to 2 feet high with stiff scattered hairs. Leaves ovate, lowermost ones lyrate, toothed and stalked; uppermost lanceolate, sessile, often undivided, toothed. Pods spreading, longer than the compressed beak, glabrous or rough with stiff reflexed hairs.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | April 25. | 1868. | April 2. |
| 1866. | April 28. | 1869. | Feb. 16 (hybernated.) |
| 1867. | May 6. | 1870. | May 19. |

3. **S. alba** Linn. *White Mustard.*

Bab. 30. Hook. 30 (Brassica). Benth. 40.
Cultivated fields. A. May to December.

Very similar to the former in appearance, but recognized at once by its pods, which are very hairy and have a broad, flat, sword-shaped beak.

Equally common with the last. I cannot make out any districts peculiar to either one or the other.

| | | | |
|---|---|---|---|
| 1865. | by June 5. | 1868. | fl. and seed May 19. |
| 1866. | ——— | 1869. | full fl. May 12. |
| 1867. | ——— | 1870. | May 31. |

## 11. Alyssum Linn.

1. **A. calycinum** Linn.

Bab. 31. Hook. 33. Benth. 43.
Ploughed land. A. May, June.

Stem almost woody, generally branching at the base, from 3 to 9 inches high. Leaves scattered on the stem, strap-shaped and sessile, covered, as well as the stem, with stellate hairs. Flowers small, pale yellow and crowded at the tops of the stems, which lengthen out after flowering, so that the pods are arranged in long racemes.

Very scarce—found by *J.S.* in the fields at the back of the Grand-Stand on Marlborough Common, and by *S.F.T.* in the neighbouring fields.

1869. By May 21. 1870. Seed, June 30.

**A. incanum** Linn., has been found by *G.W.D.L.* in a clover-field near the reservoir, Crofton. Its occurrence in England is very rare, and it is of course an alien.

It is a larger plant than the former, the stem more branched, the leaves more pointed, the flowers white and the style very long.

Found July 15, 1870, in full flower, but with very few seed pods.

## 12. Draba Linn.

1. **D. verna** Linn. *Common Whitlow-grass.*

Bab. 32. Hook. 33 (Erophila). Benth. 45.

Walls, banks, &c. A. March to May.

From 1 to 3 or 4 and even 8 inches high. Leaves all radical, ovate and closely spreading on the ground. Petals deeply cleft. Raceme lengthening after flowering. Pods ovoid, on long stalks of various length. Seeds numerous.

Abundant. On the downs this plant is seldom more than one inch or so in height. In the Pewsey Vale specimens six or eight inches in height are frequent.

| | |
|---|---|
| 1865. April 6. | 1868. March. 14. |
| 1866. By March. 10. | 1869. Feb. 26. |
| 1867. March. 4. | 1870. March. 6. |

## 13. Armoracia Rupp.

1. **A. rusticana** Rupp. *Horse-Radish.*

Bab. 33. Hook. 34 (Cochlearia Armoracia). Benth. 41.

Waste ground, escaped from gardens. P. May, June.

Stem from 2 to 3 feet high, much branched in its upper part. Radical leaves sometimes a foot long, on long stalks, of very varied shape: generally merely wavy and toothed at the edges, but sometimes deeply cut so as to be more or less pinnatifid, but not necessarily uniformly so. Stem leaves smaller and narrower, flowers small and white, petals twice as long as the calyx. Pods, when developed, ovoid, but never ripening seeds in this country. Its large leaves and tall stem render this plant easily recognizable.

I.—Fyfield.

II.—Bedwyn.

| | |
|---|---|
| 1865. By May 11. | 1868. May 19. |
| 1866. ——— | 1869. April 29. |
| 1867. June 5. | 1870. By May 26. |

## 14. Thlaspi Linn.

1. **T. arvense** Linn. *Penny Cress.*

Bab. 34. Hook. 37. Benth 46.

Fields. A. May, June.

Stem from 6 inches to a foot or more high, simple or branched. Radical leaves stalked, but soon disappearing; stem leaves oblong, sessile, with 2 acute auricles; all entire or remotely toothed. Flowers small, white. Pods very broad and conspicuous, with a deep notch at the end.

I.—Pewsey, *J.S.* Woodborough, *J.S.* and *F.E.T.*

## 15. Lepidium Linn.

1. **L. campestre** R. Br. *Common Pepper-wort.*

Bab. 35. Hook 37. Benth. 49.

Dry gravelly soil. A. or B. April, May, and sometimes to November.

Stem from 1 to 2 feet high, generally solitary. Radical leaves stalked, pinnatifid or entire; uppermost leaves sessile, oblong, with two sharp auricles, denticulate, more or less hoary, rarely glabrous. Flowers small, white. Pods numerous in a long raceme, nearly surrounded with a wing, narrow at the base, but broad and notched at the top, *with a single seed in each cell.*

I.—Preshute, *J.W.M.*; Ivy's Farm, *J.J.P.*; Clench. Burbage, *W.B.* Wootton Rivers, *J.J.P.* West Woods.

| | |
|---|---|
| 1865. fl. and seed, May 17. | 1868. April 3. |
| 1866. Bud April 30. | 1869. Bud April 15. |
| 1867. April 21. | 1870. May 16. |

## 16. Capsella Vent.

1. **C. Bursa-pastoris** D.C. *Shepherd's Purse.*

Bab. 36. Hook 35. Benth. 48.

Everywhere. A. March or April and throughout the year.

Radical leaves deeply pinnatifid or quite entire, stem leaves sessile with pointed auricles. Flowers small, white. Always known by its triangular pods, however variable the leaves may be.

| | |
|---|---|
| 1865. Before April 18. | 1868. March 14. |
| 1866. April 16. | 1869. Feb. 13. |
| 1867. Feb. 14 March 31. | 1870. March 29. |

## 17. Senebiera Pers.

**1. S. Coronopus** Poiret. *Swine's-Cress.*

Bab. 36. Hook 36. Benth 51.

Waste ground. A. June to August.

Stems prostrate, from 2 to 12 inches long. Leaves once or twice pinnately divided. Flowers small, white. Pods marked with deep wrinkles. Racemes at first forming dense heads, but as the fruit ripens, lengthening out to 1 or 2 inches.

I.—Rick-yards at Manton and Hatfield. Pewsey, *T.F.R.*

III.—Poulton, Folly Farm, and Mildenhall.

IV.—Barton Farm and Sun Lane, near Marlborough. Avebury, *F.E.T.*

1868. June 2.
1869. ———
1870. June 21.

## 18. Raphanus Linn.

**1. R. Raphanistrum** Linn. *Jointed Charlock.*

Bab. 37. Hook. 41. Benth. 53.

Corn-fields. A. June, July, and sometimes to November.

Stem from 1 to 2 feet high, much branched and with a few stiff hairs on the stem. Lower leaves few, lyrate, with a large terminal lobe; upper leaves lanceolate, serrate. Flowers white or yellow with lilac veins. Pods with from 4 to 8 constrictions and a long beak, not splitting into 1-seeded segments, but "falling off whole, leaving the barren stalk-like first joint attached to the pedicel."

I.—Pewsey, *T.F.R.* Oare, *J.S.* New Mill, *G.W.D.L.*

II.—Axford, *J.S.* Bedwyn, *G.W.D.L.*

1865. June 27.
1866. May 29.
1867. ———
1868. ———
1869. By May 27.
1870. June 7.

## 7. RESEDACEÆ.

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# 1. Reseda Linn.

Petals 4-6, entire or deeply cut. Stamens 10-24, filaments variously united, inserted on a glandular, irregular, one-sided disk. Carpels 3 or 4, ovary 1-celled, opening at the end before the seeds are ripe.

There are two species about Marlborough, easily recognized by their leaves. The common garden Mignonette, to which the two species present some resemblance, is a native of Egypt.

### 1. R. lutea Linn. *Wild Mignonette.*

Bab. 38. Hook. 42. Benth. 54.

Waste chalky places. B. May to September.

Leaves 3-cleft or pinnatifid. Sepals 6. Two upper petals with two lateral lobes. Lateral petals with a single wing, lower ones nearly entire.

Very widely spread, but very few plants in each locality.

I.—West Woods, *F.R.S.* Overton, *J.S.*

II.—Great Bedwyn, *F.E.T.*

III.—Mildenhall, *J.S.* Axford. Between 4 and 5 mile Clumps, *A.C.H.*

IV.—Rookley, *J.B.G.* Broad Hinton, *F.E.H.*

| | |
|---|---|
| 1865. May 22. | 1868. By June 10. |
| 1866. June 9. | 1869. May 29. |
| 1867. By June 10. | 1870. May 20. |

### 2. R. Luteola Linn. *Weld.*

Bab. 38. Hook. 41. Benth. 54.

Waste chalky places. B. June, July.

Leaves linear-lanceolate, undivided. Sepals 4. Petals usually 4, upper one 3-, 4-, or 5-cleft, 2 lateral 3-cleft, lower one (or two) linear, entire.

Very uncommon: the only locality known at present is at Bedwyn, *J.S*

| | |
|---|---|
| 1865. June 10. | 1868. ——— |
| 1866. ——— | 1869. ——— |
| 1867. ——— | 1870. June 17. |

## 8. CISTACEÆ.

### 1. Helianthemum Gaert.

1. **H. vulgare** Gaert. *Common Rock-rose.*

Bab. 39. Hook. 42. Benth. 56.

Dry places. P. May to October.

A low shrubby plant with a pair of stipules at the base of each leaf. Leaves oval, opposite, green above, hairy beneath. Sepals 5, the two outer very small. Petals 5, yellow. The flowers bear some resemblance, at first sight to those of *Potentilla reptans*, a plant belonging to the next Divison *(Calyciflorœ)*, and therefore essentially distinct from this one: in fact a very slight examination is sufficient to show the difference.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | May 19. | 1868. | May 9. |
| 1866. | May 22. | 1869. | May 16. |
| 1867. | June 3. | 1870. | May 16. |

## 9. VIOLACEÆ.

### 1. Viola Linn.

The only genus of the Order in England. The Violets and Pansies seem almost too well known to need much description, but there has been much confusion among the former; and the Sweet and Dog-Violets are often imagined to be the only two species, the former scented and the latter not. There are, however, (only referring to the species found about Marlborough) no less than four species of Violet, one of them having two sub-species.

Upper petals directed forwards, stipules not leafy.

Nearly stemless

| | |
|---|---|
| Leaf-stalks with deflexed hairs ... ... ... | 1. odorata. |
| Leaf-stalks with spreading hairs ... ... ... | 2. hirta. |

Stem elongated
Flowering branches from a short central rosette 3. sylvatica.
No central rosette ... ... .. ... ... ... 4. canina.
Upper petals erect, stipules leafy .. ... ... ... ... ... 5. tricolor.

1. V. odorata Linn. *Sweet Violet.*

Bab. 40. Hook. 44. Benth. 58.
Banks and hedges. P. Feb. to April.

This and the next have at first sight a considerable resemblance to one another, and differ from the other species of the genus by their tufted appearance, the leaves growing apparently from the root—whilst in the other species the plant seems to spread more: the flower-stalks in these two species, also, rise from the tuft, being attached to the main stem of the plant, in the other species they spring from the branches. These two plants can, therefore, be recognized at a glance. The chief distinctions between the two are the following:—

*Odorata* has lax trailing shoots from the crown of the root, rooting at intervals (called *stoles*); bracts *above* the middle of the stalk; flowers sweet-scented; petioles with deflexed hairs, and hence presenting a glabrous appearance at first sight.

*Hirta* has no stoles (or very rarely some short ones); bracts *below* the middle of the stalk; flowers scentless (or very slightly scented); petioles with spreading hairs. The whole plant is also more hairy in all its parts than *odorata*.

Common.

1865. March 23. 1868. March 1.
1866. Feb. 28. 1869. Jan. 17.
1867. Feb. 23. 1870. March 21.

Cultivated specimens are generally earlier than wild ones.

2. V. hirta Linn. *Hairy Violet.*

Bab. 40. Hook. 44. Benth. 58.
Open woods and pastures. P. March, April.

See under *V. odorata* for the chief characteristics.

Abundant—more so than *odorata*.

1865. Nearly over by April 30. 1868. March 15.
1866. March 23. 1869. Full fl. March 12.
1867. April 6. 1870. March 25.

3. V. sylvatica Fries. *Wood Violet.*

Bab. 41. Hook. 45. Benth. 58.

On Hedgebanks or in Thickets. P. April to June and in the autumn.

There are probably two species included under this name—viz., *Reichenbachiana* (Bor.) and *Riviniana* (Reich.)—which may be thus distinguished—

a. *V. Reichenbachiana*—Lower leaves hardly as broad as long, upper leaves decidedly narrower than long; calycine appendages* small, becoming indistinct as the capsule ripens; petals lilac, narrow, the lower one with a few nearly simple veins at the base; spur darker than the petals, rather narrow and becoming thicker towards its rounded apex.

b. *V. Riviniana*—Lower leaves as broad as (or broader than) long, upper leaves a little narrower than long; calycine appendages becoming very conspicuous; petals blue, the lower one with many branched dark veins at the base; spur usually yellowish white, thick, furrowed and notched at the apex.

var. *b* is by far the commonest of the two, and is very abundant in hedge-banks and copses.

*a.* has been found in

I.—Fox wood.

III.—Rabley, *F.E.T.*

| | | |
|---|---|---|
| 1865. | (a) Sep. 14. | (b) Sep. 15. |
| 1866. | (a) April 11. | (b) April 11. Oct. 24. |
| 1867. | (a) full fl. April 17. | (b) April 8. |
| 1868. | ——— | ——— |
| 1869. | (a) March4, April 20. | (b) Feb. 20, March 6. |
| 1870. | (a) April 12. | (b) April 16. |

* The Sepals in this genus are produced at the base beyond their point of union with the receptacle and thus appear to be fastened to it by their sides. The free part, beyond the base, is called the CALYCINE APPENDAGE.

4. V. canina Linn. *Dog Violet.*

Bab. 41. Hook. 45. Benth. 58.

On Commons. P. May, June.

Distinguished from *V. sylvatica* by its having no central rosette, both the primary and lateral stems lengthening and flowering. Leaves thicker, longer, and blunter, and, though heart-shaped at the base, far less so than in *V. sylvatica*. Flowers bluish purple, all the petals being strongly marked with darker veins.

A scarce species.

I.—Clench, *R.R.P.H.*

II.—Savernake Forest, *C.A.S.*

IV.—Marlborough Common.

| | | | |
|---|---|---|---|
| 1865. | before May 25. | 1868. | by May 17. |
| 1866. | by June 4. | 1869. | May 6. |
| 1867. | ——— | 1870. | May 13. |

5. **V. tricolor**, Linn. *Heartsease. Pansy.*

Bab. 42. Hook. 45. Benth. 59.

Fields. A. April to October and sometimes all the winter.

Easily recognized by its large stipules divided into several linear or oblong lobes, the central one being the largest. Upper petals purple, lateral ones bluish, lower one yellow, longer than the sepals. Capsule ovoid.

The more common form is var. *a. V. arvensis*, (Murr.) of which the petals are shorter than the calyx and pale yellow or whitish, and the capsule globular.

| | | | |
|---|---|---|---|
| 1865. | ——— | (a). | April 5. |
| 1866. | May 25. | (a). | April 17. |
| 1867. | full fl. April 21. | (a). | March 25. |
| 1868. | March 4. | (a). | April 8. |
| 1869. | April 23. | (a). | April 8. |
| 1870. | April 25. | (a). | March 25. |

## 10. POLYGALACEÆ.

### 1. Polygala Linn.

1. **P. vulgaris** Linn. *Milk-wort.*

Bab. 44. Hook. 46. Benth. 60.

Dry pastures. P. April to August.

Sepals 5, remaining after flowering, the 3 outer small, the 2 inner (called *wings*) much larger, coloured and veined; after flowering they lie flat on the capsule and become greener. Petals (blue, pink or white) connected together, the lowermost keel-shaped and tipped with a little crest of narrow segments.

Abundant on the Downs.

| | | | |
|---|---|---|---|
| 1865. | April 29. | 1868. | April 23. |
| 1866. | May 7. | 1869. | April 25. |
| 1867. | May 4. | 1870. | April 25. |

## 11. CARYOPHYLLACEÆ.

Plants with opposite leaves and *jointed stems*, by which latter character especially they are at once distinguished from all other Thalamifloral flowers.

*Sepals united, forming a tube.*

Styles 2

Petals 5, stem 1-3 feet high ... 1. Saponaria.

Petals 0, stem a few inches high ... 11. Scleranthus.

Styles 3 ... ... ... ... ... 2. Silene.

Styles 5 ... ... ... ... ... 3. Lychnis.

*Sepals distinct*

No stipules

Petals small, entire (rarely none)

Styles 3 ... ... ... ... 5. Arenaria.

Styles 4 or 5

Sepals entirely green ... 4. Sagina.

Sepals with broad white membranous margins 9. Moenchia.

Petals notched or 2-cleft.

Styles 3 ... ... ... 6. Stellaria.

Styles 4 or 5

A tall plant, growing in damp places ... ... ... 7. Malachium.

Low plants in dry places ... 8. Cerastium.

Stipules thin, dry and semi-transparent 10. Spergula.

### 1. Saponaria Linn.

1. S. officinalis Linn. *Soapwort.*

Bab. 49. Hook. 50. Benth. 64.

Hedges. P. August.

A tall glabrous plant, with ovate leaves, 2 or 3 inches long, and strongly marked with 3 or 5 ribs. Flowers large and handsome, pale pink, often double.

Occurs only in a hedge at Poulton. The flowers are double; it is therefore doubtless an escape.

## 2. Silene Linn.

1. **S. inflata** Sm. *Bladder Campion. White Bottle.*

Bab. 50. Hook. 51. Benth. 66.

Fields and roadsides P. June to August.

Plants generally glabrous, growing in loose, straggling, bushy tufts. Calyx inflated, whitish green with darker veins. Petals white, deeply cleft. Flowers in loose panicles.

Not very abundant near Marlborough.

| | |
|---|---|
| 1865. June 3. | 1868. May 20. |
| 1866. June 4. | 1869. May 27. |
| 1867. June 10. | 1870. May 30. |

## 3. Lychnis Linn.

Sometimes (though rarely) there are only 3 or 4 styles, in which case the species may with equal justice be referred to *Silene*, in fact Syme places numbers 2 and 3 under *Silene*.

Calyx-teeth shorter than the petals

Calyx swollen after flowering, petals 2-fid.

Flowers white, capsule ovoid ... 2. vespertina.

Flowers red, capsule globular ... 3. diurna.

Calyx not swollen, petals 4 cleft ... 1. Flos-cuculi.

Calyx with long narrow lobes exceeding the petals 4. Githago.

1. **L. Flos-cuculi** Linn. *Ragged Robin.*

Bab. 52. Hook. 52. Benth. 68.

Moist places. P. May to July.

Remarkable for each of its petals being cut into 4 long linear lobes, by which it can be at once recognized.

Very uncommon in the immediate vicinity of Marlborough.

I.—Pewsey, *T.F.R.* Osier bed near the College.

II.—Canal beyond Tottenham *J.J.P.* Bedwyn.

III.—Froxfield, *J.J.P.* Mildenhall, *F.R.S.* Axford, *J.S.*

| | |
|---|---|
| 1865. May 23. | 1868. May 19. |
| 1866. By June 7. | 1869. May 7. |
| 1867. May 23. | 1870. By May 28. |

2. **L. vespertina** Sibth. *White Campion.*

Bab. 52. Hook. 53. Benth. 68.

Fields. B. May to October.

The flowers of this and the next are generally *diœcious*, i.e., having the flowers of the same plant with stamens only or pistils only. In either case the rudiments of the other parts are present. A difference will therefore be observed in the calyces. Those of the stamen-bearing flowers not being swollen, of the fertile ones ovate. Flowers sweet-scented in the evening; white, rarely pink. As the flowers of *diurna* are sometimes pink, these two are by some considered to be merely varieties of the same species. The chief distinctions between the two are

*Vespertina* calyx-teeth lengthened, erect; capsule conical.
*Diurna*, calyx-teeth triangular, recurved; capsule globular.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | May 13. | 1868. | May 19. |
| 1866. | May 28. | 1869. | May 1. |
| 1867. | May 16. | 1870. | May 20. |

3. **L. diurna** Sibth. *Red Campion.*

Bab. 52. Hook. 53. Benth. 68.

Damp hedgebanks. P. April to November.

For remarks about this species, see under the previous one.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | April 16. | 1868. | April 25. |
| 1866. | May 8. | 1869. | April 20. |
| 1867. | May 4. | 1870. | April 21. |

4. **L. Githago** Lam. *Corn-Cockle.*

Bab. 53. Hook. 53 (Githago segetum.) Benth 68.

Corn-fields. A. June, July.

A very different looking plant than any of the previous ones of the genus. Calyx leathery, ribbed, with five very long segments. Petals large, purple. Flowers solitary, on long stalks.

Generally distributed, but not common.

| | | | |
|---|---|---|---|
| 1865. | June 7. | 1868. | June 10. |
| 1866. | ——— | 1869. | May 15. |
| 1867. | ——— | 1870. | June 15. |

## 4. Sagina Linn.

Small, tufted plants, with awl-shaped leaves and small flowers. Two species only have as yet been detected near Marlborough, though it is odd that *S. apetala* has not yet been recorded. These two species are distinguished at once by the size of their petals.

### 1. S. procumbens Linn. *Pearlwort.*

Bab. 53. Hook 61. Benth 69.
Waste ground and damp walls. P. May to July.

Branches long, procumbent, generally rooting, springing from a central rosette, which never lengthens nor flowers. Leaves opposite, linear, fleshy, suddenly contracted into a short point. Petals 4, very small, often wanting. Not uncommon.

| | | | |
|---|---|---|---|
| 1865. | By May 31. | 1868. | April 4. |
| 1866. | ——— | 1869. | Full fl. May 27. |
| 1867. | May 11. | 1870. | By May 27. |

### 2. S. nodosa Meyer. *Knotted Spurrey.*

Bab. 55. Hook. 62. Benth. 70.

Primary stem short, not flowering, lateral stems spreading on the ground at their base and then erect, seldom branched. Leaves awl-shaped, upper ones much shorter, and arranged in tufts. Flowers 1, 2, or 3 together at the end of the stems. Petals white, twice as long as the sepals.

Has only been found at Rockley by *J.J.P.*

## 5. Arenaria Linn.

Three species have as yet been detected near Marlborough, which may be thus distinguished.

Leaves half-an-inch long, thin, 3 nerved ... ... 1. trinervis.
Leaves scarcely 2 lines long, rather rigid.
Capsule ovate ... ... ... ... ... ... ... 2. serpyllifolia
Capsule oblong ... ... ... ... ... ... ... 3. leptoclados

1. A. **trinervis** Linn. *Three-nerved Sandwort.*

Bab. 56. Hook. 59. Benth. 73.

Damp shady places. A. April to June.

Stem weak, branched, downy, about a foot high. Upper leaves sessile, lower stalked. Flowers from the forks of the stem and axils of the upper leaves. Sepals acute. Petals shorter than the calyx.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | May 3. | 1868. | April 4. |
| 1866. | April 30. | 1869. | April 20 |
| 1867. | May 3. | 1870. | April 20. |

2 A. **serpyllifolia** Linn. *Thyme-leaved Sandwort.*

Bab. 56. Hook. 59. Benth. 72.

Dry places and walls. A. May, June.

A much-branched, slender annual, about 6 inches high. Leaves ovate, pointed, firm in texture, and all in the same plant about the same size. Petals shorter than the sepals.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | Seed June 3. | 1868. | March 14. |
| 1866. | May 26. | 1869. | May 9. |
| 1867. | Fl. and seed June 22. | 1870. | May 19. |

3. A. **leptoclados** Guss.

Bab. 57. Hook. 60. Benth. —

Dry places and walls. A. May, June.

A much more slender plant than the former and differing in the shape of the capsules. It is by many considered to be merely a variety of *serpyllifolia:* Bentham does not even notice it.

I.—Overton, *J.S.* Bath Road, near Marlborough, *J.S.*

III.—Old walls near Marlborough, *F.H.T.*

1869. Full fl. May 23. 1870. Full fl. May 26.

## 6. Stellaria. Linn.

The four Marlborough species may be thus distinguished.

Leaves ovate, lower ones stalked

Stem round... ... ... ... ... ... ... 1. media.

Stem 4 angled ... ... ... ... ... ... 4. uliginosa

Leaves narrow-lanceolate, sessile, grassy looking.

Petals longer than the calyx ... ... ... 2. Holostea

Petals shorter than the calyx ... ... ... 3. graminea

**S. media** Vill. *Common Chickweed.*

Bab. 58. Hook. 57. Benth. 77.
Waste places. A. All the year.

A most variable plant, but easily recognized by a line of hairs on the stem and branches.

Abundant.

1865. March 18.
1866. Feb. 18.
1867. By Feb. 11.
1868. By Feb. 13.
1869. All the year.
1870. All the year.

Proobably lasts all the year.

**2. S. Holostea** Linn. *Greater Stitchwort.*

Bab. 58. Hook. 57. Benth. 78.
Woods and hedges. P. April to June.

About 2 feet high with weak brittle stems, with rough angles. Leaves sessile, narrowing gradually to a sharp point. Flowers large. Bracts leaf-like.

Abundant.

1865. April 24.
1866. April 12.
1867. April 19.
1868. April 9.
1869. Feb. 27. March 25.
1870. April 11.

**3. S. graminea** Linn. *Lesser Stitchwort.*

Bab. 58. Hook. 57. Benth. 78.
Dry heathy and bushy places. P. June, July.

A smaller plant than the last, with smooth angles to the stem and petals shorter than the calyx. Bracts thin, membranous.

I.—Not uncommon.
II.—Cadley.
III.—Mildenhall Borders.

1865. May 23.
1866. Full fl. June 23.
1867. June 15.
1868. May 31.
1869. June 2.
1870. May 30.

4. **S. uliginosa** Murr. *Bog Stitchwort.*

Bab. 59. Hook. 58. Benth. 78.

Wet places. A. May, June.

Usually about a foot high—stems numerous, weak. Leaves with a small callous point Sepals united below into a funnel-shaped tube. Petals very small.

Not uncommon in the water meadows.

| | | | |
|---|---|---|---|
| 1865. | ——— | 1868. | May 19. |
| 1866. | About May 16. | 1869. | By May 27. |
| 1867. | ——— | 1870. | May 28. |

## 7. Malachium Fries.

Very closely allied to *Stellaria*, with which it is often united. It differs from that genus in having 5 styles and 5 bi-fid valves to the capsules.

1. **M. aquaticum** Fries. *Great Chickweed.*

Bab. 59. Hook. 56. Benth. 77.

Wet places. P. July, August.

Plant viscid. Stem weak, angular. Leaves ovate, 1-1½ inches in length. Flowers solitary in the forks of the stem. Petals 2-cleft rather exceeding the sepals, which at first are only 2 lines long, but increase after flowering.

I.—Fyfield, *J.S.*; Overton, *J.S.*

## 8. Cerastium Linn.

Plants from three to eighteen inches high, hairy and much branched from their base. At present only two species have been detected near Marlborough: these are very different in appearance but not so easy to discriminate on paper.

Sepals acute, hairy throughout... ... ... ... 1. glomeratum.

Sepals bluntish, with membranous margin and glabrous tips ... ... ... ... ... ... ... 2. triviale.

1. **C. glomeratum** Thuill. *Broad-leaved Mouse-ear.*

Bab. 59. Hook. 55. Benth 75.

Fields and Banks. A. April, May.

Whole plant pale yellowish green, covered with hairs, several of which are glandular. Fruit-stalks very short, so that the flowers appear to be crowded together.

Not uncommon.

| | | | |
|---|---|---|---|
| 1865. | Ap. 26. | 1868. | Ap. 3. |
| 1866. | Ap. 16. | 1869. | March 7. |
| 1867. | March 29. | 1870. | Ap. 26. |

2. C. triviale Linn. *Narrow-leaved Mouse-ear.*

Bab. 60. Hook. 55. Benth. 75.

Fields. B. or P. April to November or December.

Whole plant deep dull green, covered with hairs, but none of them tipped with glands. Fruit stalks longer than the sepals.

Abundant.

| | | | |
|---|---|---|---|
| 1865. | May 7. | 1868. | ——— |
| 1866. | May 21. | 1869. | April 11. |
| 1867. | ——— | 1870. | April 1. |

## 9. Mœnchia Ehrh.

I. M. erecta Sm. *Upright Moenchia.*

Bab. 61. Hook. 54. (Cerastium quaternellum) Benth. 73.

Dry gravelly and sandy places. A. May.

A small erect, glaucous, annual, from one to four inches high. Leaves linear, lanceolate, pointed, rigid. Sepals longer than the petals, with broad white membranous margins. Flowers few, white, rather large for the size of the plant.

A very insignificant plant, and one easily overlooked; hence it probably appears much rarer than it really is.

II.—Great Bedwyn, *W.B.*

IV.—Rockley, *J.S.*

## 10. Spergula Linn.

1. S. arvensis Linn. *Corn Spurry.*

Bab. 63. Hook. 62. Benth. 80.

Cultivated land. A. May to October.

A slender plant, from 6 to 12 inches high. Leaves linear, fleshy, growing in tufts on opposite sides of the stem, and spread out so as to appear whorled. Flowers small, white, on long stalks, which are turned down after flowering.

Plentiful in the green-sand district, but not found near Marlborough.

I.—Abundant in Pewsey Vale.

II.—Bedwyn, *J.S.* and *G.W.D.L.* Folly Farm.

III.—Chiseldon, *E. im T.*

IV.—Avebury.

| | | | |
|---|---|---|---|
| 1865. | Bud May 25. | 1868. | ——— |
| 1866. | Fl. and seed May 15. | 1869. | ——— |
| 1867. | ——— | 1870. | May 27. |

## 11. Scleranthus Linn.

1. **S. annuus** Linn. *Knapwell.*

Bab. 63. Hook. 66. Benth. 384.

Sandy fields. A. June to August.

This seems a very unnatural place for this species, which is in fact included in Division 4 by Bentham and Syme. From having several affinities to Caryophyllaceæ it is placed here.

A much-branched spreading annual, from 2 to 8 inches high. Leaves very narrow—sepals united below, so as to form a funnel-shaped tube, the free portions of the sepals equal in length to the tube, increasing after flowering. Petals none. Flowers solitary below, and crowded at the ends of the branches above.

I.—Martinsell, *J.S.* Huish, *J.S.*

III.—Mildenhall.

## 12. MALVACEÆ.

## 1. Malva Linn.

Readily known by their regular flowers, the petals being united at their base to one another and to the tube formed by the filaments of the numerous stamens, which are united in a ring round the pistil. Carpels numerous, arranged in a ring round a common axis. Styles as many as the carpels.

We have only three species near Marlborough, which are thus characterised by Bentham :—

Stem prostrate, Petals not twice as long as the calyx ... ... 3. rotundifolia.

Stem erect, Petals 3 or 4 times the length of the calyx.

Leaves with short lobes; flowers in axillary clusters 2. sylvestris.

Leaves deeply cut into narrow lobes; flowers crowded at the summits of the branches ... ... ... 1. moschata.

1. **M. moschata** Linn. *Musk Mallow.*

Bab. 64. Hook. 72. Benth. 91.

Gravelly places. P. June to October.

Leaves variable. The radical ones with short broad lobes (similar to those of *M. sylvestris*, but known at once by their more delicate structure), the upper ones deeply divided. Flowers large, rose coloured or white.

A variety has been found in which the upper leaves are somewhat similar to the radical leaves. This is probably the var. *Ramondiana*, of Grenier and Godron.

Generally distributed, but not common.

| | | | |
|---|---|---|---|
| 1865. | June 21. | 1868. | June 21. |
| 1866. | ——— | 1869. | Bud June 10. |
| 1867. | ——— | 1870. | June 10. |

2. **M. sylvestris** Linn. *Common Mallow.*

Bab. 64. Hook. 71. Benth. 91.

Roadsides. P. June to November.

Stem erect, from 1 to 2 feet high. Leaves kidney-shaped, with 5-7 deep lobes, the central one longer than the others. Flowers large, purple.

Not very common.

| | | | |
|---|---|---|---|
| 1865. | May 28. | 1868. | By May 31. |
| 1866. | June 19 (full Nov. 11). | 1869. | June 6. |
| 1867. | June 9. | 1870. | May 27. |

3. **M. rotundifolia** Linn. *Dwarf Mallow.*

Bab. 64. Hook. 72. Benth. 90.

Waste places. P. May to December.

Stem decumbent. Leaves kidney-shaped, but less so than in *sylvestris*, with the lobes much shallower. Flowers small, pale lilac.

I.—Manton. East Kennett. Overton, *J.S.*; Pewsey, *J.S.*; New Mill, *G.W.D.L.*

III.—Mildenhall.

| | | | |
|---|---|---|---|
| 1865. | fl and seed June 18. | 1868. | May 13. |
| 1866. | ——— | 1869. | May 1. |
| 1867. | June 9. | 1870. | May 30. |

## 13. TILIACEÆ.

### 1. Tilia Linn.

1. T. **europæa** Linn. *Lime-Tree.*

Bab. 65. Hook. 73. (Tilia parvifolia.) Benth. 93.

Cultivated. Tree. July.

A tree frequently cultivated about Marlborough. Leaves heart-shaped, glabrous, except woolly tufts at the branching of the veins beneath. Sepals 4 or 5; petals 4 or 5; Stamens many, distinct or slightly connected into bundles at their base. Flowers pale whitish green, hanging in small clusters by long stalks which are bordered half-way down by a pale leaf-like bract.

| | | | |
|---|---|---|---|
| 1865. | June 26. | 1868. | June 22. |
| 1866. | not by July 3. | 1869. | ——— |
| 1867. | not by June 26. | 1870. | July 3. |

## 14. HYPERICACEÆ.

### 1. Hypericum Linn.

Herbs with opposite leaves, often marked with glandular dots. Sepals and petals 5. Stamens numerous, united (in the Marlborough species) into 3 sets.

Of the twelve British species, only five are at present known to occur near Marlborough. They may be thus distinguished.

| | | |
|---|---|---|
| Stem round | | |
| stem hairy ... ... ... ... ... | 4. | hirsutum. |
| stem glabrous ... ... ... ... | 5. | pulchrum. |
| Stem with 4 distinct angles ... ... | 1. | tetrapterum. |
| Stem with 2 angles, not very prominent | | |
| stem erect ... ... ... ... ... | 2. | perforatum. |
| stem trailing ... ... ... ... | 3. | humifusum. |

**1. H. tetrapterum** Fries. *Square-stalked St. John's-wort.*
**H. quadrangulum** Sm.

Bab. 67. Hook. 69. Benth. 85.

Wet places. P. July to September.

Stem with 4 prominent wings, not much branched, branches short. Leaves ovate, partially clasping the stem, with numerous nearly transparent dots. Flowers crowded at the end of the stems, pale yellow.

Not uncommon.

| | | | |
|---|---|---|---|
| 1865. | ——— | 1868. | ——— |
| 1866. | not by July 1. | 1869. | ——— |
| 1867. | ——— | 1870. | June 20. |

**2. H. perforatum** Linn. *Common St. John's-wort.*

Bab. 67. Hook. 69. Benth. 85.

Woods and hedgebanks P. July to November.

Stem generally with 2 ridges, branching in the upper part; branches much longer than in *tetrapterum*, so as to present a much more bushy plant. Leaves oblong, sessile, with several dots, which, with the primary veins, are semi-transparent. Sepals with a few glandular lines or dots; petals bright yellow with numerous black dots, especially near the edges. Styles as long as the capsule.

Common.

| | | | |
|---|---|---|---|
| 1865. | June 25. | 1868. | ——— |
| 1866. | not by July, over by Sep. 1. | 1869. | ——— |
| 1867. | fl. bud June 19. | 1870. | June 20. |

3. **H. humifusum** Linn. *Trailing St. John's-wort.*

Bab. 68. Hook. 69. Benth. 86.

Gravelly and heathy places. P. July to August.

Stems numerous, trailing, from 4 to 10 inches long. Leaves oblong, with or without semi-transparent dots; primary veins only semi-transparent, the edges often turned down, and with black glands. Sepals very unequal, with a few gland-tipped hairs near their tips; petals with black dots on the margins; styles very short. Flowers few, small, pale yellow.

Known at once by its trailing stems and small flowers.

I.—Overton, *J.S.*; West Woods, *J.W.M.*; Clench, *R.R.P.H.*

II.—Great Bedwyn, *J.S.*; Savernake Forest, *J.J.P.*

| | |
|---|---|
| 1865. ——— | 1868. ——— |
| 1866. not by July 1. | 1869. ——— |
| 1867. ——— | 1870. June 17. |

4. **H. hirsutum** Linn. *Hairy St. John's-wort.*

Bab. 68. Hook. 70. Benth. 86.

Woods and thickets. P. June to September.

Stems numerous, round, hairy, nearly simple, only slightly branched at their top. Leaves oval, rather long and slightly stalked, and with semi-transparent dots, more or less hairy on the veins beneath. Sepals lanceolate, acute, fringed with shortly-stalked glands. Petals pale yellow, tipped with stalked glands.

Not uncommon.

| | |
|---|---|
| 1865. June 19. | 1868. June 19. |
| 1866. not by July 1. | 1869. ——— |
| 1867. ——— | 1870. June 25. |

5. **H. pulchrum** Linn. *Upright St. John's Wort.*

Bab. 68. Hook. 70. Benth. 86.

Dry woods and heaths. P. June to August.

Stems glabrous, erect, stiff, with very short branches. Leaves cordate, very blunt, with numerous semi-transparent dots and embracing the stem. Sepals ovate, blunt, fringed with sessile glands. Petals yellow, tinged outside with red, and fringed with glands. Anthers red.

I.—Not uncommon.

II.—Bedwyn, *W.B.*

III.—Mildenhall Borders.

| | |
|---|---|
| 1865. ——— | 1868. June 19. |
| 1866. June 21. | 1869. ——— |
| 1867. ——— | 1870. June 21. |

## 15. ACERACEÆ.

### 1. Acer Linn.

Of this genus we have only two species in England, both of them trees, though one of them, from its slow growth, is but seldom seen in any other state than as a bush in our hedges or as a straggling plant, hardly worthy of the name of tree.

1. **A. campestre** Linn. *Common Maple.*

Bab. 69. Hook. 83. Benth. 102.

Woods and hedges. Tree. May, June.

Leaves 5-lobed, edges entire, glabrous above, often downy beneath. Corymbs of flowers erect, wings of carpels spreading horizontally so as to be almost in the same line. Bark very thick and corky with deep fissures.

| | | | |
|---|---|---|---|
| 1865. | April 26. | 1868. | May 6. |
| 1866. | May 6. | 1869. | April 22. |
| 1867. | April 28. | 1870. | May 12. |

2. **A. Pseudo-platanus** Linn. *Sycamore.*

Bab. 69. Hook. 84. Benth. 102.

Cultivated. A tall tree. April to June.

Leaves 5-lobed, the edges serrate. Flowers in pendulous racemes, wings of the carpels parallel, or at right angles to one another, never spreading into one straight line.

| | | | |
|---|---|---|---|
| 1865. | April 22. | 1868. | April 20. |
| 1866. | April 27. | 1869. | May 7. |
| 1867. | May 3. | 1870. | May 12. |

## 16. GERANIACEÆ.

Flowers regular with 5 sepals and 5 petals. Stamens 5 or 10, united at the base. Ovary 5 lobed, each with one seed. These lobes (or carpels) are arranged round a long projecting axis to which the styles are united. After flowering the styles become hard and elastic, and, as soon as the seeds are ripe, twist up, carrying with them the carpels, turning them round so as to project the seeds to some distance.

The two genera are thus distinguished

Stamens 10 .. ... ... ... 1. Geranium.

Stamens 5 ... ... ... ... 2. Erodium.

# 1. Geranium Linn.

Herbs, mostly annual, with kidney-shaped leaves, more or less lobed. Flowers two together on long stalks. They may be thus tabulated :—

*Petals more or less notched.*

Leaves deeply divided.

Flowers very large, bluish purple ... ... ... 2. pratense.

Flowers small.

Flower-stalks much longer than the leaves 6. columbinum.

Flower-stalks not longer than the leaves ... 5. dissectum.

Leaves roundish, not deeply divided ... ... ... 3. molle.

*Petals entire.*

Leaves in 3 distinct segments ... ... ... ... ... 8. robertianum.

Leaves deeply divided.

Flowers dark purple, plant hairy... ... ... 1. Phæum.

Flowers pink, plant glabrous, *shining* ... 7. lucidum.

Leaves shortly divided into broad lobes... ... ... 4. rotundifolium.

## 1. G. Phæum Linn. *Dusky Crane's-bill.*

Bab. 70. Hook. 76. Benth. 95.

Hedges, (an escape). P. May, June.

Plant bushy, about 2 feet high, perennial. Leaves yellowish-green, lobed, lobes acute. Petals waved at the edges, dark purple, by which the plant may be at once recognized.

I.—Preshute, *F.R.S.* Field near Martinsell, *J.J.P.*

| | | | |
|---|---|---|---|
| 1865. | May 8. | 1868. | April 30 |
| 1866. | May 12. | 1869. | May 15. |
| 1867. | May 4. | 1870. | May 12. |

## 2. G. pratense Linn. *Meadow Crane's-bill.*

Bab. 70. Hook 76. Benth. 96.

Meadows and waste places, especially if damp. P. May to Oct. or Nov.

Plants from 1 to 3 feet high, perennial. Leaves deeply divided, uppermost ones sessile. Flowers very large, fine bluish purple.

Common. A white variety occurs at Overton, *J.S.*

| | | | |
|---|---|---|---|
| 1865. | May 25. | 1868. | June 19. |
| 1866. | June 13. | 1869. | May 20. |
| 1867. | May 29. | 1870. | May 26. |

3. **G. molle** Linn. *Dove's-foot.*

Bab. 71. Hook. 76. Benth. 97.

Dry places. A. April to November.

A low bushy, annual, covered with soft hairs. Leaves roundish, with from 7 to 9 deep segments, which are contiguous, so as to preserve the rounded form of the leaf. Petals deeply divided, with fine hairs on the lower parts. Styles red. Carpels wrinkled.

Common.

| | |
|---|---|
| 1865. April 28. | 1868. April 9. |
| 1866. April 28. | 1869. April 20. |
| 1867. May 1. | 1870. April 26. |

4. **G. rotundifolium** Linn. *Round-leaved Crane's-bill.*

Bab. 71. Hook. 77. Benth. 97.

Waste places. A. May to Oct. or Nov.

Very similar in appearance to *G. molle*, but rather stouter, especially when full-grown. Lobes of the leaves broader and not so deep. Petals *entire*, without any hairs. Carpels not wrinkled, but with spreading hairs.

Waste ground, Marlborough College.

| | |
|---|---|
| 1865. April 29. | 1868. May 6. |
| 1866. May 12. | 1869. By May 10. |
| 1867. By June 6. | 1870. May 16. |

5. **G. dissectum** Linn. *Cut-leaved Crane's-bill.*

Bab. 72. Hook. 77. Benth. 97.

Fields and waste places. A. May to September.

A straggling plant varying from 6 inches to 2 feet in height. Leaves deeply cut almost to their base into 5 or 7 lobes, themselves with narrow segments. Flowers small, purple, on stalks shorter than the leaves.

Common.

| | |
|---|---|
| 1865. May 17. | 1868. May 11. |
| 1866. May 29. | 1869. May 11. |
| 1867. By June 2. | 1870. May 14. |

6. **G. columbinum** Linn. *Long-stalked Crane's-bill.*

Bab. 72. Hook. 77. Benth. 98.

Banks and dry corn fields. A. May to Aug. or Oct.

Somewhat similar to the last but much more delicate in every part. Sepals with a very long point, petals not longer than the sepals, rose-purple. Flowers on very long stalks, far exceeding the leaves.

I.—Side of Pewsey Road, *J.J.P.*; Pewsey, *T.F.R.*; Field near Ivy's Farm, *A.C.A.*; side of Bath Road, near Marlborough, *J.S.*

III.—Stitchcomb, *J.S.*; Rabley Copse, *J.J.P.*; Poulton. Mildenhall; *W.M.*; Manton Copse, *J.P.*

| | |
|---|---|
| 1865. June 5. | 1868. June 3. |
| 1866. ——— | 1869. May 15. |
| 1867. ——— | 1870. May 3. |

**7. G. lucidum** Linn. *Shining Crane's-bill.*

Bab. 72. Hook. 78. Benth. 96.

Hedgebanks. A. May to August.

Plant from 6 inches to 1 foot high, nearly glabrous, and shining green, but frequently turning red. Sepals ending in a fine point, and closing together in fruit. Calyx with 5 prominent angles. Petals rose-pink.

I.—Marlborough College Grounds.

III.—Lane at the east end of the town. Stitchcomb, *J.S.*

IV.—Lane near the Workhouse. Fyfield, *C.E.T.*

| | |
|---|---|
| 1865. April 27. | 1868. May 4. |
| 1866. May 2. | 1869. April 26. |
| 1867. May 3. | 1870. April 27. |

**8. G. robertianum** Linn. *Herb Robert.*

Bab. 72. Hook. 77. Benth. 96.

Hedgebanks and waste places. A. April to November.

Plant from 6 inches to 1 foot or more high, with scattered soft hairs, frequently turning red in all its parts, with a strong smell. Leaves divided into three primary divisions, each of them once or twice deeply cut. Sepals with a very long point, hairy and slightly glandular.

Abundant.

| | |
|---|---|
| 1865. April 27. | 1868. May 3. |
| 1866. April 30. | 1869. April 27. |
| 1867. May 1. | 1870. April 28. |

## 2. Erodium L'Herit.

**E. cicutarium** Sm. *Stork's-bill.*

Bab. 73. Hook. 78. Benth. 98.

Cultivated ground, introduced. A. June to October.

Plant spreading on the ground, hairy. Leaves pinnate, the leaflets sessile and deeply cut. Flowers small, purplish, from 3 to 12 together, in umbels at the end of long stalks.

Only found occasionally.

I.—Pewsey, *T.F.R.*; Savernake, *J.S.*

IV.—Field adjoining the Bath-road, about a mile from Marlborough.
1869. June 5.

## 17. OXALIDACEÆ.

*(Numbered 18 in the table).*

## 1. Oxalis Linn.

Leaves trifoliate, like those of the clover. Sepals 5; Petals 5; Stamens 10.

The two Marlborough species of this genus are distinguished at once by their flowers.

| | |
|---|---|
| Flowers white, stalks 1 flowered ... ... | 1. Acetosella. |
| Flowers, small, yellow, stalks 2 flowered | 2. corniculata. |

### 1. O. Acetosella Linn. *Wood-Sorrel.*

Bab. 74. Hook. 79. Benth. 100.
Woods and shady places. P. April, May.

Rootstock slender, knotted with thickened scales. Leaves radical, on long stalks, with three leaflets, of an acid flavour. Flower stalks long, bearing a single flower and 2 bracts about half-way down. Stamens 10, 5 long and 5 short, only slightly united at their base.

Common in the Forest and about Martinsell. Scarce near Malborough.

| | |
|---|---|
| 1865. April 17. | 1868. March 22. |
| 1866. Full fl. April 23. | 1869. April 20. |
| 1867. April 13. | 1870. April 19. |

### 2. O. corniculata Linn. *Procumbent Yellow Wood-Sorrel.*

Bab. 74. Hook. 79. Benth. 100.
Gardens: introduced. A June to September.

Plant downy, lying on the ground. Leaves trifoliate, each leaflet strongly heart-shaped. Flowers small, yellow.

A weed in Mr. Brind's garden, Marlborough, where it has been established for some years.

## 18. LINACEÆ.

*(Numbered 17 in the Table).*

# 1. Linum Linn.

1. **L. usitatissimum** Linn. *Common Flax.*

Bab. 75. Hook. 74. Benth. 88.

An escape from cultivation. A. July to October.

Stem solitary, 1 to 1½ feet high. Leaves narrow-lanceolate, alternate, sessile. Flowers a rich blue.

A single specimen found at Mildenhall by Mrs. Thompson.

2. **L. catharticum** Linn. *Purging Flax.*

Bab. 76. Hook. 74. Benth. 89.

Dry pastures. A. May to July or October.

Stems glabrous, from 2 to 6 inches high. Leaves oblong, sessile, arranged in pairs on the stem. Flowers small, white. Buds drooping.

Common.

| | | | |
|---|---|---|---|
| 1865. | May 25. | 1868. | May 16. |
| 1866. | Full fl. June 13. | 1869. | May 22. |
| 1867. | May 18. | 1870. | May 20. |

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PRINTED BY C. PERKINS, "TIMES" OFFICE,

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